135972

RECORD OF DECISION
DECLARATION

SITE NAME AND LOCATION

Avtex Fibers NPL Site - Operable Unit One
1169 Kendrick Lane
Front Royal, Virginia

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Avtex Fibers NPL Site - Operable Unit 1 in Front Royal, Virginia. The selected remedial action has been developed in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. The attached index identifies the items which comprise the administrative record upon which the selection of the remedial action is based.

The State of Virginia concurs on the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

This operable unit is the first of two operable units planned to address contamination at the site. This operable unit addresses ground water contamination and remediation of the contaminant plume. As an interim remedial measure, this operable unit addresses dewatering of Viscose Basins 9, 10, and 11 (the source). The function of this operable unit is to address ground water contamination caused by leaching of fluids from Viscose Basins 9, 10, and 11; and, to reduce further leaching of fluids from the basins while further bench scale and treatability studies of the source are conducted. The second operable unit will address source control and treatment.

The major components of the selected remedy include:

- the use of existing on-site pumping wells, numbers 1, 2 and 3 to pump and recover the contaminated ground water;
- installation of modified wells or extraction trenches in Viscose Basins 9, 10, and 11 for dewatering operations;
- pumping and treatment of contaminated ground water and basin liquid in the existing on-site activated sludge wastewater treatment plant following necessary upgrades, modifications and construction of pretreatment units;
- periodic monitoring of on-site and off-site ground water, surface water, and basin fluids throughout the operation and maintenance;

- placement of deed restrictions prohibiting the use of ground water on the affected properties;

DECLARATION

The selected remedy is protective of human health and the environment, is expected to attain Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

EPA believes that the recommended operable unit one remedy will remediate ground water contamination in the future. However, hazardous substances will be present in ground water as long as viscose basins 9, 10 and 11 (the source of the contamination) are unremediated. Remediation of viscose basins will be addressed in the second operable unit.

9/30/88
Date

for Stanley L. Laskowski
Acting Regional Administrator
EPA Region III

RECORD OF DECISION
DECISION SUMMARY

I. Site Name, Location, and Description

Avtex Fibers, Inc. is located at 1169 Kendrick Lane in Warren County, Front Royal, Virginia as shown in Figure 1.

Scrap batches of viscose, zinc, and other wastes were disposed of in 23 unlined basins and/or landfilled at the site over a period of 45 years (Figure 2).

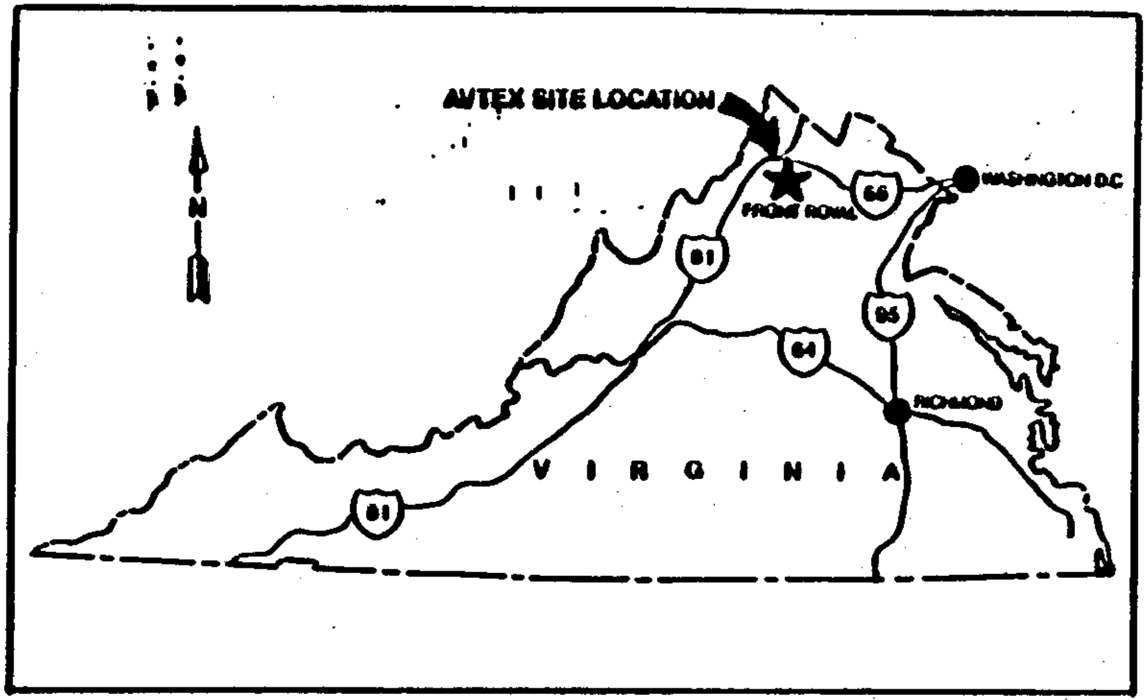
Front Royal in located in northwest Virginia along the boundary of the Valley and Ridge and Blue Ridge physiographic provinces. The facility covers approximately 440 acres. The facility is bounded to the northwest and west by the South Fork of the Shenandoah River and to the South, northwest, and east by residential areas. Approximately 1300 people live within one mile of the Site. At the Avtex Fibers Site, the viscose basins are located on a relatively flat terrace which is at an elevation of approximately 510 feet above mean sea level (MSL). Immediately west of the viscose basins, toward the river, the ground surface drops abruptly to approximately 490 feet above MSL. This elevation change establishes the limits of the 100 year floodplain for the Shenandoah River. The flood plain region is flat for approximately 1,000 feet. At the edge of the flood plain region the grade descends approximately 20 feet to the river. The normal pool level of the river is at 470 feet above MSL. The Shenandoah River is the only major natural surface water body adjacent to the facility and is designated as a Class IV river by the Virginia State Water Control Board (SWCB).

The Avtex facility is located on river alluvial deposits of sand, silt, clay, and meta-igneous cobbles. These surficial deposits are approximately 10 to 20 feet thick, as recorded from the installation of onsite monitoring wells. The river deposits are underlain by the Martinsburg Formation. Locally, the formation consists of massive and fractured greenish-gray shale with occasional void spaces and stringers of silty sandstone. In general, the attitude of the formation beds is nearly vertical with geologic strike trending northeast-southwest.

The ground water flow system is controlled by the bedding-plane fractures, parallel to the structural strike of the shale bedrock. The general direction of ground water through the fractured shale is from the Avtex facility toward the southwest and the Shenandoah River. The groundwater migrating from the vicinity of the viscose basins pushes past the Shenandoah River at depth and migrates beneath Rivermount acres.

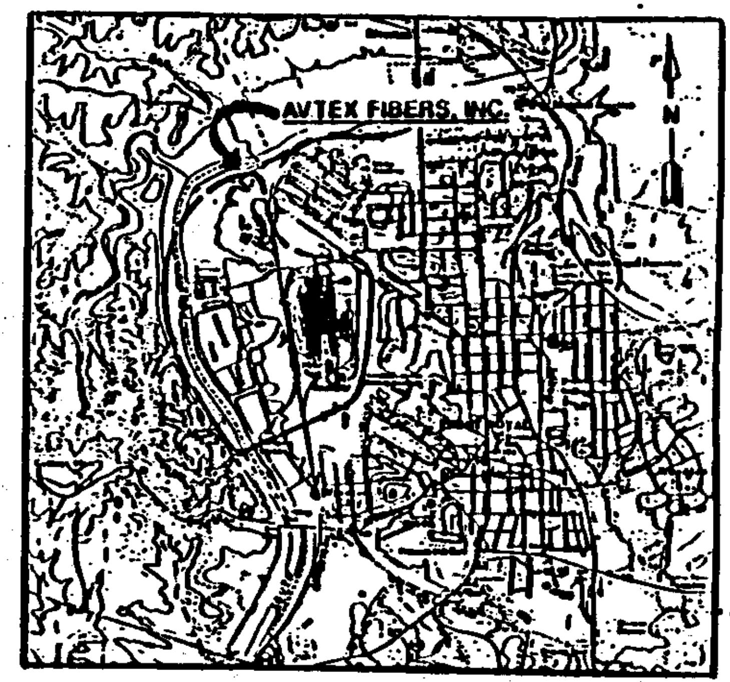
II. Site History and Enforcement Activity

The Avtex Fibers site has been in operation since 1940, when American Viscose opened the plant for rayon production. Subsequently, the site was sold to FMC Corporation in 1963, and to its present owner, Avtex Fibers, Inc., in 1976. Rayon fibers has been in constant production at the site since its opening; polyester was made there between 1970 and 1977, and polypropylene has been produced since 1985.



0 20 MILES
SCALE

SITE VICINITY MAP



SOURCE: USGS TOPOGRAPHIC QUADRANGLE, FRONT ROYAL, VA 1978

0 1 MILE
SCALE

SITE LOCATION MAP

FIGURE 1

GMCE
G&M CONSULTING ENGINEERS INC

SITE LOCATION MAPS
FEASIBILITY STUDY FOR
AVTEX FIBERS, INC.
FRONT ROYAL, VIRGINIA

GJK

AR304212

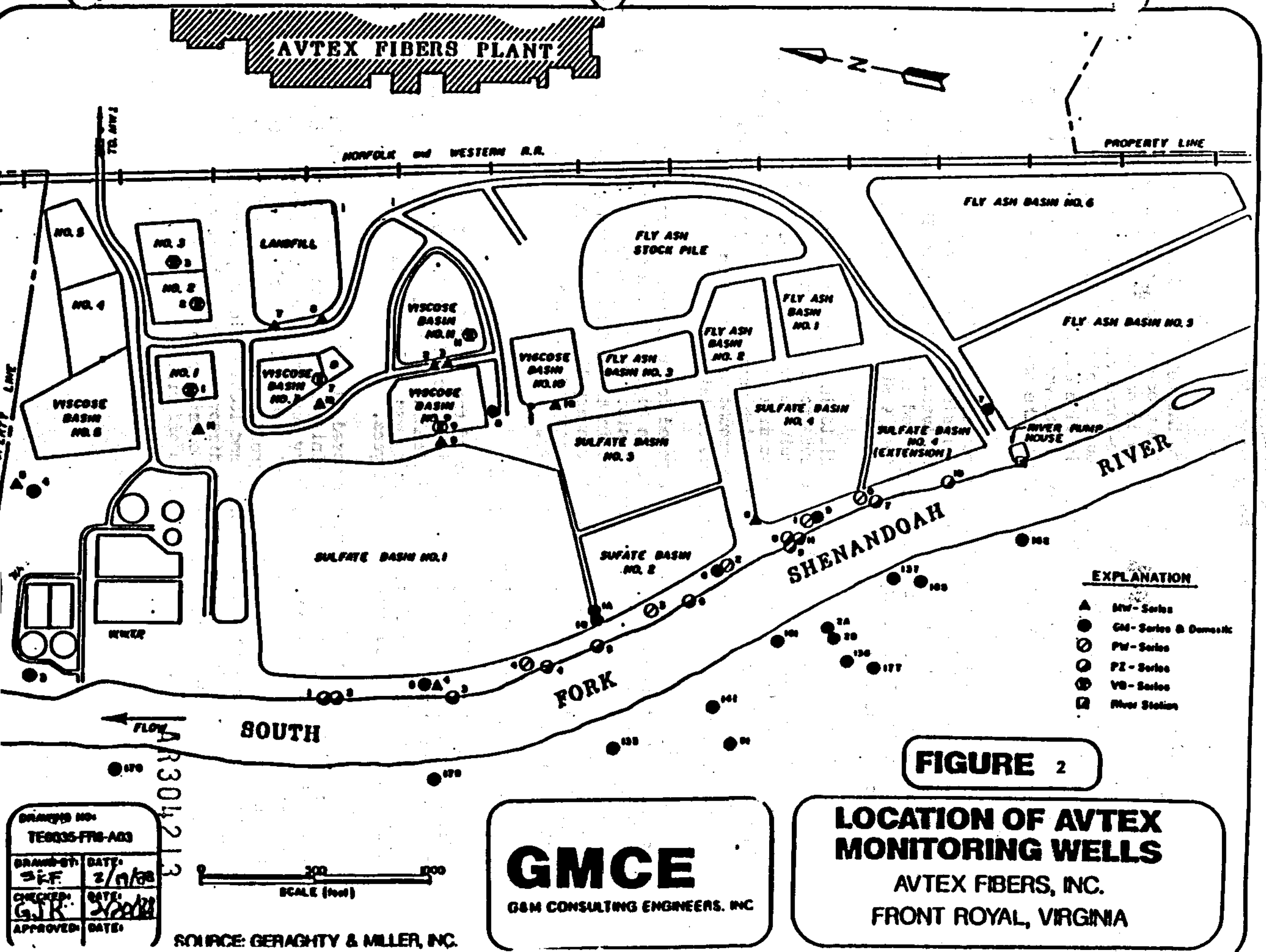


FIGURE 2

LOCATION OF AVTEX MONITORING WELLS

AVTEX FIBERS, INC.
FRONT ROYAL, VIRGINIA

AR304213

The rayon-manufacturing process has not changed significantly during the 48 years the plant has operated. The process has generated two major byproducts which have been land disposed in on-site surface impoundments. These byproducts are sodium cellulose xanthate-based viscose and zinc-hydroxide sludge. Fly-ash (material from incinerator exhaust by air-pollution control devices) and boiler house solids had been disposed in five other surface impoundments. The practice of land disposing the viscose waste was ended in 1983. Since 1983, the waste viscose has been routed directly to the on-site wastewater treatment plant.

In 1982, carbon disulfide, a constituent of the viscose waste, was identified in ground water samples from residential wells (Rivermont Acres) located across the Shenandoah River from Avtex. Due to this discovery, the Virginia State Water Control Board requested that Avtex perform a ground water investigation. In February 1983, Geraghty & Miller were retained by Avtex to conduct such studies.

As the result of the initial field investigation, Avtex implemented interim remedial measures in 1983 and 1984 to address the identified contamination. The interim remedial measures included the purchase of 23 of the Rivermont Acres subdivision properties on the west side of the Shenandoah River. Houses in this subdivision had domestic wells which were affected by the identified contamination. Avtex also initiated a ground water pumping and treatment program for purposes of contaminant recovery and containment.

The Avtex Fibers Site was proposed for inclusion on the National Priorities List (NPL) in October 1984. In August 1986, a Consent Order for the conduct of the Remedial Investigation/Feasibility Study (RI/FS) was signed by Avtex Fibers and EPA. Field work defined in the RI/FS Work Plan was conducted between May 1987 and January 1988. In January 1988, the consent order was amended to include FMC Corporation as a respondent. The RI/FS reports were released to the public on August 27, 1988.

III. Community Relations History

In 1983, following the release of the Avtex Fibers, Inc. consultants (Geraghty & Miller) report, local officials from the SWCB, the Warren County office of the Lord Fairfax Health and Planning District and the Town of Front Royal held a public meeting. The meeting was well attended and many of the citizens in attendance were Avtex employees.

Since Avtex Fibers, Inc. purchased 23 of the 38 properties in Rivermont Acres in 1983, citizen interest has diminished. Citizens who have retained ownership of their properties remain very interested in site related development, and the Rivermont Acres Property Owners' Association continues to work to protect the interests of its membership. The group's efforts often involve an exchange of correspondence with Avtex officials and local officials; sometimes the group arranges press conferences. Since the discovery of ground water contamination in 1983, the public has been kept informed of site-related developments by news releases from SWCB, according to an SWCB official.

The interim Administrative Record was sent to the site repository located at the Samuels Public Library in Front Royal in June 1988. The proposed plan was available for public comment on August 27, 1988. A public meeting concerning the proposed plan was held September 14, 1988. The meeting was well attended and many of the cititzens in attendance were Avtex employees. Response to community concerns are addressed in the Responsiveness Summary which represents the final portion of this Record of Decision (ROD).

IV. Scope and Role of Response Action within Site Strategy

This operable unit is the first of two operable units planned to address contamination at the site. The first operable unit will address ground water remediation and interim remedial measures for waste Viscose Basins 9, 10, and 11. The second operable unit will address source control and viscose basin remediation.

Ground water pumping and treatment are proposed to reduced the toxicity and mobility of contaminants in the ground water related to the viscose waste basins. Dewatering of free liquids in the viscose basins is proposed as an interim remedial measure within this operable unit. Basin dewatering is an interim measure required before any of the technologies for treatment that were presented in the draft Feasibility Study Report could be employed. At this time the total reduction in toxicity via dewatering, and the leachability of residues from the dewatered waste, is conjecture. Therefore, the appropriate treatment of the dewatered waste can not be determined. EPA recommends that the decision of the preferred final remedial response action for the viscose waste basins be deferred until the toxicity of the dewatered waste can be verified. Bench scale studies and treatability studies must be conducted concurrently with the interim measure to determine what final treatment of the dewatered viscose waste is appropriate.

V. Site Characteristics

The remedial investigation confirmed the source of the ground water contamination to be Vicose Basins 9, 10 and 11.

Two rounds of ground water samples were collected. Parameters of interest for all of the ground water sampling locations were as follows: (See Figure 2 for sampling locations.)

Alkalinity	Potassium	pH
Arsenic	Magnesium	Sulfide
Cadmium	Manganese	Sulfate
Chloride	Sodium	TDS
COD	Nitrate	TOC
Conductivity	Lead	TSS
Iron	Phenolics	Zinc

Additionally, carbon disulfide was analyzed for each sample. Several of the collected samples during both the first and second round of sampling were also analyzed for the full Contract Laboratory Program (CLP) Target Compound List (TCL) of organic parameters.

To date, the data collected from monitoring wells and the results of aquifer performance tests have indicated that laterally, the plume is within a narrow fracture system.

The results of ground water analyses indicated two distinct geochemical patterns are discernible at the Avtex Fibers Site. With respect to carbon disulfide, total phenolics, cadmium and pH, a plume of ground water contamination was identified (See Figure 3). Degradation of the ground water with respect to these parameters is attributable to the leaching of viscose-waste material disposed within Viscose Basins 9, 10, and 11. The constituents detected also reflect the constituents identified on the west side of the Shenandoah River at Rivermont Acres.

Within this plume of contamination, a narrow band of elevated arsenic concentrations was also identified. The presence of the dissolved arsenic is the result of the interaction between the high pH fluids within the viscose basins and the impoundment berms which are composed of clay with a fly-ash core.

The second geochemical pattern in the ground water is illustrated by the sulfate and total dissolved solids parameters as shown in Figure 4. Ground water degradation with respect to these two parameters is facility wide. This facility-wide ground water degradation with respect to the non-hazardous constituents was not the focus of the FS and will not be addressed by this ROD. However, remedial actions which recover the viscose waste constituents in ground water from the west side of the river will also capture these secondary constituents within the area of influence of the pumping.

The sampling of solid and liquid phases within the viscose basins provided specific data on the waste characteristics. For solid samples collected within Basins 1, 2, 3, and 7, carbon disulfide concentrations were less than 3.0 milligrams per kilogram (mg/kg). Liquid samples collected from the piezometers installed within the basins were found to contain less than 1.5 milligrams per liter (mg/l) of carbon disulfide. Ground water samples from wells hydraulically down gradient did not contain detectable levels of carbon disulfide.

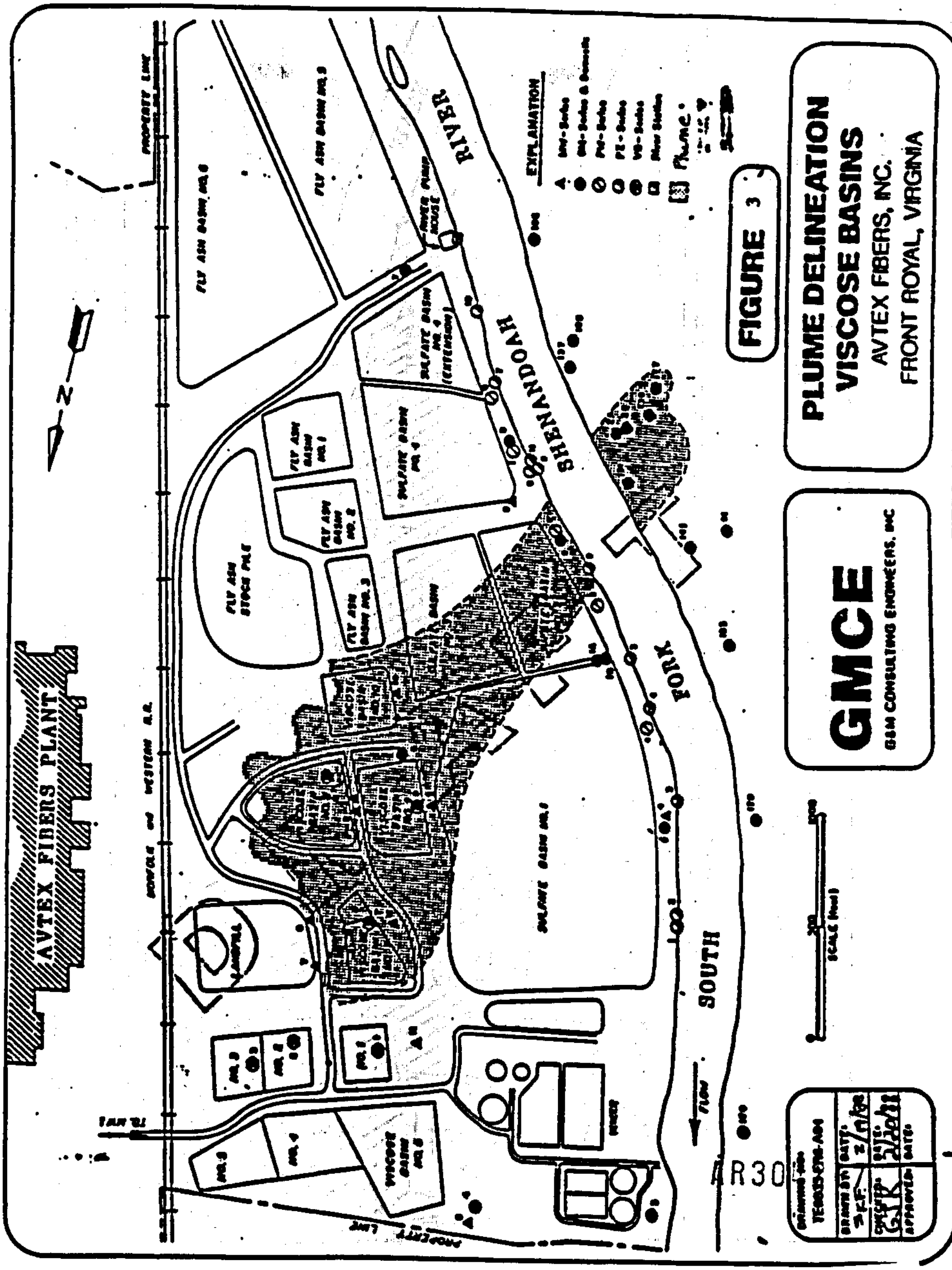
Solid samples from Viscose Basins 9, 10, and 11 contained as much as 20,000 mg/kg carbon disulfide. Measurement of water levels from wells and piezometers installed in and around these three basins suggests hydraulic communication between the basins and the ground water regime. Geochemical data demonstrate that wells MW-2, 3, 9, 10, and GM-8 contain appreciable concentrations of carbon disulfide and confirm that Viscose Basins 9, 10, and 11 are the primary source of the contaminant plume.

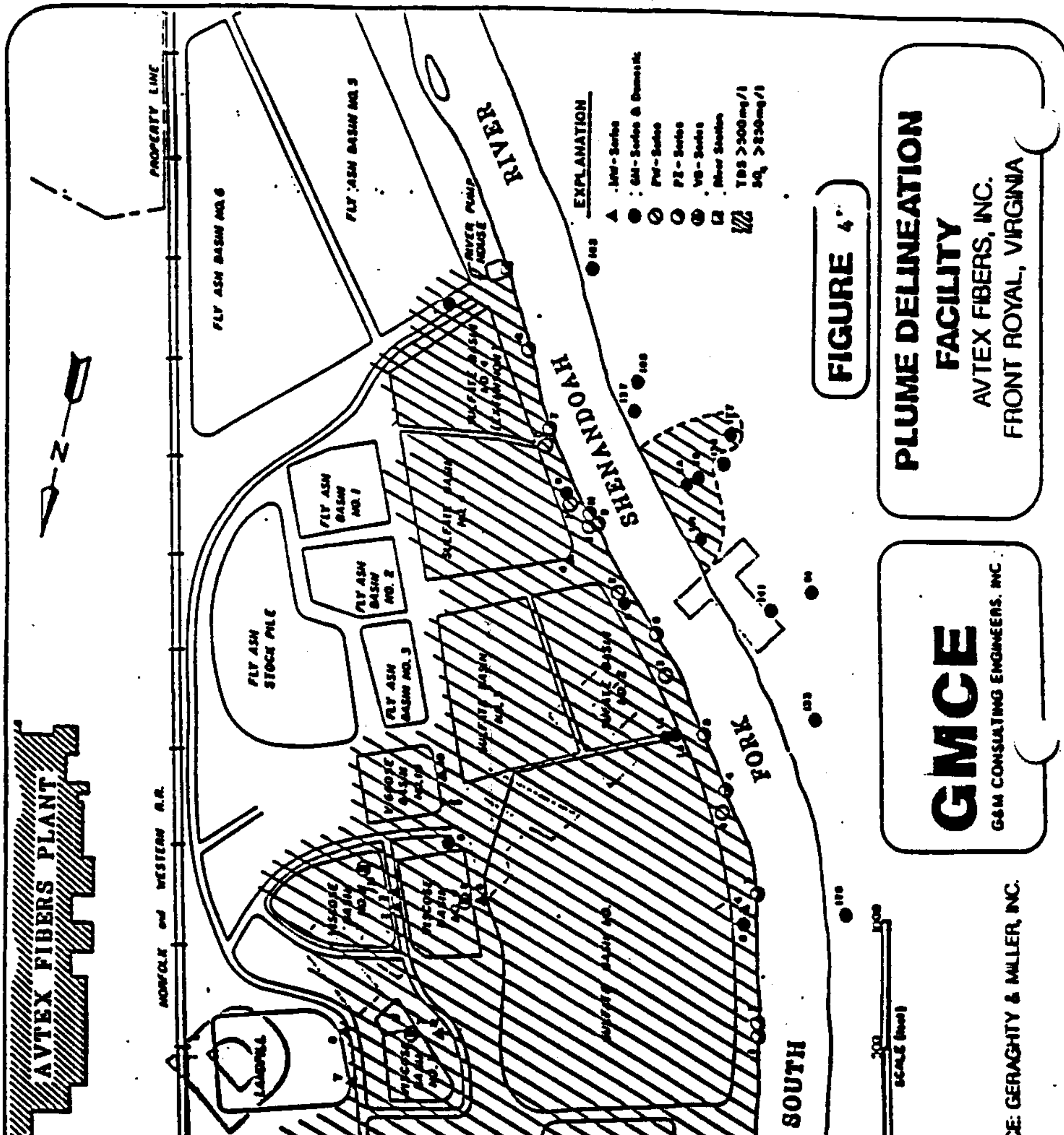
Tables 1 and 2 provide a summary of the analytical results for the groundwater samples and the viscose basin samples.

Based upon current use and future use conditions, the potential exposure pathways associated with the site are:

- Dermal contact with solid or liquid viscose waste

- Dermal contact with ground water and basin liquids pumped for treatment


AVTEX FIBERS PLANT
NORFOLK and WESTERN R.R.
PROPERTY LINE
FLY ASH STOCK PILE
FLY ASH BASIN NO. 1
FLY ASH BASIN NO. 2
FLY ASH BASIN NO. 3
SULFATE BASIN NO. 4
RIVER PUMP HOUSE
SOUTH FORK SHENANDOAH RIVER
FLOW
EXPLANATION
Plume
FIGURE 3
PLUME DELINEATION
VISCOSE BASINS
AVTEX FIBERS, INC.
FRONT ROYAL, VIRGINIA
GMCE
G&M CONSULTING ENGINEERS, INC
AR30


AVTEX FIBERS PLANT
PROPERTY LINE
FLY ASH BASIN NO. 6
FLY ASH BASIN NO. 5
RIVER PUMP HOUSE
RIVER
SHENANDOAH
FORK
SOUTH
FLY ASH STOCK PILE
FLY ASH BASIN NO. 1
FLY ASH BASIN NO. 2
FLY ASH BASIN NO. 3
NORFOLK and WESTERN R.R.
LANDFILL
VISCOSE BASIN NO. 8
PROPERTY LINE
SCALE (feet)
FLOW
EXPLANATION
FIGURE 4
PLUME DELINEATION
FACILITY
AVTEX FIBERS, INC.
FRONT ROYAL, VIRGINIA
GMCE
G&M CONSULTING ENGINEERS, INC.
SOURCE: GERAGHTY & MILLER, INC.

AR30...

TABLE 1

Analytical Results for Viscose Basin Solid and
Liquid Waste Sample Collected [illegible] September 1987

Constituent	Solid Waste (mg/kg) Surficial Range	Solid Waste (mg/kg) Surficial Average Detected Concentration	Solid Waste (mg/kg) Subsurface Range	Solid Waste (mg/kg) Subsurface Average Detected Concentration	Common Range in Soil a/	Liquid Waste (mg/L) Range	Liquid Waste (mg/L) Average Detected Concentration
Carbon disulfide	0.070	0.070	0.17 - 20,000	3,100	— b/	1.5 - 3,400	1,000
Arsenic	0.42 - 12	4.4	0.25 - 13.1	3.4	1 - 50	0.16 - 0.20	0.18
Cadmium	0.0	0.0	7.0 - 11	9.0	0.01 - 0.7	<0.02	—
Chloride	NA c/	—	NA	—	—	100 - 560	300
Iron	1.92 - 9,700	3,300	157 - 52,000	9,500	—	0.19 - 2.9	1.2
Lead	32 - 42	37	0.1 - 3,700	840	2 - 200	<0.2	—
Manganese	0.4 - 160	74	2.2 - 991	200	20 - 3,000	0.02 - 4.5	1.0
Phenols	<0.20	—	0.21 - 87	23	—	0.02 - 20	6.7
Sodium	65 - 25,000	8,905	46 - 113,000	36,000	—	2,400 - 15,000	8,200
Sulfate	NA	—	NA	—	—	170 - 9,400	3,600
Zinc	274 - 7,900	4,400	13.3 - 2,900	390	10 - 300	0.06 - 1.8	0.69

a/ USEPA, 1983
b/ Not available
c/ Not Analyzed

Source: Endangerment Assessment prepared by Geraghty & Miller, Inc.

002/12

AR304219

619/4

TABLE 2

Analytical Results of Ground-Water Samples
Collected in September 1987

(concentrations reported in mg/L)

3944

Constituent	Virginia Ground-Water Standard	East Side Along River: Frequency of Detection Above Standard	East Side Along River: Range	East Side Along River: Average Detected Concentration	West Side Along River: Frequency of Detection Above Standard	West Side Along River: Range	West Side Along River: Average Detected Concentration	Shallow Monitor Wells near Viscose Basins: Frequency of Detection Above Standard	Shallow Monitor Wells near Viscose Basins: Range	Shallow Monitor Wells near Viscose Basins: Average Detected Concentration
Carbon disulfide	0.7 a/	2/17	.006 – 360	49.	2/11	.007 – 470	150	2/7	.022 – 2,800	1,100
Arsenic	0.05	2/25	.004 – .07	.019	2/11	.027 – .32	.21	1/7	.003 – .087	.045
Cadmium	0.0004	6/25	.0058 – .032	.018	0/11	—	—	0/7	—	—
Chloride	250 b/	0/25	26 – 120	75	0/11	2.4 – 160	38	3/7	44 – 1,900	480
Iron	0.3 b/	20/25	.05 – 33	3.2	9/11	.036 – 1.8	.65	5/7	.15 – 46	7.8
Lead	0.05	5/25	.015 – .229	.081	0/11	—	—	4/7	.02 – 7.1	1.1
Manganese	0.05 b/	25/25	.33 – 29	2.9	9/11	.098 – .37	.19	6/7	.14 – 15	5.9
Phenols	0.001	3/25	.03 – 2.0	1.2	2/11	6.3 – 29	18	3/7	.02 – 16	6.0
Sodium	270	24/25	82 – 1,800	940	2/11	9.3 – 4,100	730	6/7	09 – 14,700	4,500
Sulfate	250 b/	25/25	720 – 3,200	1,700	2/11	79 – 2,000	440	6/7	0.2 – 5,000	840
Sulfide (hydrogen) c/	0.02 d/	23/25	.2 – 920	70	10/11	0.2 – 1,700	520	7/7	700 – 4,600	2,400
Zinc	0.05	2/25	.04 – 19	.092	3/11	.056 – .22	.16	7/7	.13 – 9	2.4

a/ no state standard; value is EPA Office of Solid Waste Reference Dose-based water limit, assuming 20% contribution from drinking water

b/ no state ground-water standard; value is state surface water/drinking-water standard

c/ assessed as hydrogen sulfide because of highest toxicity, however, monitoring data is for total sulfides; hydrogen sulfide concentrations may be small fraction of total sulfide concentrations

d/ no state standard; concentration of H_2S for drinking water assuming 20% contribution from drinking water

AR304220

- Inhalation of volatilized constituents or fugitive dust

- Ingestion of ground water for domestic use

- Surface water through dermal contact and ingestion of locally caught fish

VI. Summary of Site Risks

Utilizing data generated during the RI, a Risk Assessment was conducted to evaluate the potential impacts to human health and the environment which may result from the release of hazardous substances from the Avtex Site. The constituents that have been detected in the waste viscose materials and ground water and considered in the Risk Assessment are arsenic, cadmium, carbon disulfide, chloride, iron, lead, manganese, phenolics, sodium, sulfate, sulfide, and zinc.

Elevated levels with respect to chloride, manganese, sodium, sulfate, and zinc were considered constituents of potential public welfare concern due to aesthetics but were not used as health-risk indicator chemicals. The indicator chemicals (those having potential adverse health risks) are arsenic, cadmium, lead, carbon disulfide, hydrogen sulfide and phenolics. Of these, only arsenic represents a known human carcinogen.

Acute and chronic toxic responses associated with the indicator chemicals are summarized in Table 3. Table 4 is a summary of toxicity profiles of indicator chemicals. Although some of the indicator chemicals may have toxic end points, the actual mechanism of toxicity varies between the chemicals, and there are no reported synergistic interactions between the indicator chemicals.

The Reference Doses (RfDs) for the indicator chemicals are derived from levels which did not result in any of the summarized toxic responses. The reference doses for the indicator chemicals are in Table 5. The RfD for arsenic is based on the federal MCL of 0.05 mg/l, and is calculated for comparison with the other constituents.

Present Use (Risk to workers on-site)

A daily intake level was calculated for skin absorption and small quantity ingestion of viscose basin solids and liquids and ground water using the equations in Tables 6, 7, and 8. For the basin solids, the intake levels were calculated for the constituents detected in the surficial samples from Viscose Basins 9, 10, and 11. For basin liquids the intake levels were calculated using the concentrations detected in the viscose basin piezometers and seep samples. For the ground water, intake levels were calculated using the average concentrations detected in the monitoring or recovery wells along the shoreline on the east side of the river, because the concentrations and the likelihood of exposure are greater on this side of the river. Intake levels are determined for worst-case working lifetime exposure.

GERAGHTY & MILLER, INC.

Table 3 Summary of Potential Toxic Responses of Constituents Associated with the Avtex Viscose Basins

Constituent	Carcinogenicity a/	Reproductive/ Teratogenicity b/	Mutagenicity c/	Acute Toxicity d/	Chronic Effects e/	Domestic Animal Toxicity f/	Environmental Toxicity g/
Arsenic	X	X	X		X	X	X
Cadmium	X	X			X	X	X
Carbon disulfide		X			X		
Hydrogen sulfide				X	X		
Lead		X			X	X	X
Phenol							

Adopted from "Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites," Office of Waste Programs Enforcement (OWPE), U. S. EPA, 1985. Criteria presented in this table is that of OWPE. An "X" indicates the chemical meets the criteria outlined by OWPE for the particular toxic effect classification. The lack of an "X" under a classification does not necessarily imply that the chemical cannot have a toxic effect.

a/ A compound is classified as carcinogenic: if it is a known or suspected human carcinogen; if it has been been shown to be carcinogenic at a particular site in more than one species or sex in a animal bioassay; or if it has been shown to increase the incidence of site-specific malignant tumors in a single species or sex, and there is a statistically significant dose-response relationship in more than one exposed group.

b/ Chemicals are classified as teratogens and reproductive toxins if there is suggestive evidence of an effect in humans or if at least one study in whole animals is clearly positive. Unsupported in vitro evidence is considered sufficient to classify a chemical as a reproductive toxicity/teratogenicity hazard.

c/ A chemical is classified as mutagenic if it has given a positive result in at least one of the mammalian in vivo or bacterial or mammalian cell in vitro assays for mutagenicity.

d/ A compound is considered to be acutely toxic if it has an oral LD50 < or = 100 mg/kg, an inhalation LC50 < or = 400 mg/cubic meter, or a dermal LD50 < or = 400 mg/kg. LD means lethal dose; LC means lethal concentration.

e/ Chemicals will be considered to cause chronic toxicity if they cause serious irreversible effects other than cancer or reproductive effects after extended exposure to oral doses of less than 100 mg/kg/day, inhalation concentrations less than 400 mg/cubic meter, or dermal doses less than 400 mg/kg/day.

f/ A chemical will be considered to be toxic to domestic animals if a demonstrated serious toxic effect has been seen in the field. Also, chemicals that cause reproductive toxicity, teratogenicity, or subchronic toxicity at oral doses of less than 100 mg/kg/day will be considered as domestic animal hazards unless they are unlikely to be present at toxic levels offsite.

g/ A chemical is classified as hazardous to aquatic wildlife if an acute LC50 is < 1000 ug/L or chronic effects are reported at < 100 ug/L; to terrestrial wildlife if toxicity has been seen in the field, if acutely toxic, or if it causes reproductive toxicity/teratogenicity at oral doses < 100 mg/kg body weight; or are persistent in the environment and are toxic at levels up to 10 times less than those indicated above.

GERAGHTY & MILLER, INC.

'Table 4 Summary Toxicity Profiles of Indicator Chemicals for the [illegible] Basin

Constituent	Acute Toxicity Summary	Chronic Toxicity Summary	Cancer Potential	Other
Arsenic	Gastrointestinal damage and cardiac abnormalities are major characteristics; also vomiting, diarrhea, conjunctivitis, rhinitis, laryngitis, bronchitis, skin eruptions, neurological signs, muscle tenderness, and transverse white lines on the finger nails.	Dermatological effects including freckling and darkened nipples and neurological paresthesia and weakness. In Antofagasta, Chile, arsenic toxicity resulted in weight loss, diarrhea, debility, anorexia, bronchitis, and skin disorders.	Skin cancer has been epidemiologically associated outside the U.S. with arsenic trioxide in drinking water.	Weak or negative in most bacterial test systems for mutagenicity. Teratogenic in animal studies.
Cadmium	Nausea, vomiting, diarrhea, muscular cramps and salivation. In severe intoxication, symptoms include sensory disturbances, liver injury, and convulsions. In fatal intoxication, these symptoms are followed by shock and/or renal failure and cardiopulmonary depression.	Chronic oral exposures can result in pain, osteomalacia, osteoporosis, proteinuria, glucosuria, and anemia. Kidneys are the most sensitive organs to low-level chronic exposure.	Lung and prostate cancer result from inhalation of cadmium smelter fumes or dust. No evidence of carcinogenicity from chronic oral exposure.	Orally administered cadmium reduced number of implants and live fetuses in rats. Cadmium does not readily cross the skin. The diet is the major source of human exposure to cadmium.
Carbon disulfide	Dizziness, headaches, poor sleep, fatigue, nervousness, anorexia, weight loss, psychosis, polyneuritis, Parkinson-like symptoms, ocular changes, and cardiovascular and gastrointestinal abnormalities.	Polyneuritis including lower extremity weakness and paresthesias. Experimentally in dogs, lesions of the corpora striata, Purkinje cells of the cerebellum and loss of anterior horn cells of the spinal cord have been demonstrated. Chronic exposure to fumes resulted in decrease of visual activity.	Inconclusive study of carcinogenicity by ICI. Inhalation carcinogenicity currently being tested.	Teratogenic in rats and mice dosed by inhalation. Inhalation is the principal route of absorption in man. Absorption through the skin and GI tract much less significant.

TABLE 4 Cont.

Constituent	Acute Toxicity Summary	Chronic Toxicity Summary	Cancer Potential	Other
Hydrogen sulfide	Exposure may cause immediate coma or death which may occur with or without convulsions. Direct irritation of the respiratory tract may cause rhinitis, pharyngitis, bronchitis, and pneumonia.	Tremors, weakness, and numbness of extremities may occur. Rare cases of polyneuritis as a result of vestibular and extrapyramidal tract damage have been observed.	No evidence of carcinogenic potential.	Negative in most bacterial test systems for mutagenicity.
Lead	No adverse effects of lead in drinking water for exposures of 10-days or less. Health effects manifested when blood lead level exceeds 15 ug/deciliter of blood. It takes a minimum of 35 days to reach this level and some time following that to express an effect.	Lead encephalopathy, the major features being dullness, restlessness, irritability, headaches, muscular tremor, ataxia, and loss of memory. Subtle behavioral changes may occur at levels below those causing encephalopathy. Other toxic responses include reduction in red blood cell lifespan and inhibition of synthesis of hemoglobin, peripheral neuropathy, and renal damage.	A dose dependent increase in renal tumors was noted in rats dosed between 500 to 2,000 ppm as lead acetate in the diet. No evidence of renal cancer following chronic exposure in man.	Lead is a cellular poison. Cellular toxicity occurs before mutagenicity could be expressed. Reproductive effects were observed at PbB levels of 26 ug/dl. Absorption through the skin is insignificant compared with the GI and respiratory tracts.
Phenol	Irritation of the eyes, nose, and throat, anorexia, loss of weight, weakness, muscle aches, pain, dark urine, cyanosis, liver and kidney damage, skin burn, dermatitis, tremor, convulsions, and twitch.	Repeated chronic exposures to phenol at high concentrations have resulted in chronic liver damage in man. At doses ranging from 50 to 100 mg/kg body weight in rats showed only slight kidney and liver alterations following 6 months of exposure.	Not carcinogenic in mice and rats orally dosed.	Equivocal evidence of mutagenicity. No evidence of teratogenicity. Phenol is readily absorbed by all routes of entry.

Table 5 Indicator Chemical Reference Doses (RfDs) for Chronic Exposure

Constituent	Chronic RfD (mg/kg/day)	Source
Arsenic	0.0014	a
Cadmium	0.00029	b
Carbon disulfide	0.10	c
Hydrogen sulfide	0.003	b
Lead	0.0014	b
Phenol	0.04	d

a/ Calculated from MCL of 0.05 mg/L assuming 70 kg adult daily ingesting 2 liters of water.
b/ Superfund Public Health Evaluation Manual (USEPA, 1986c)
c/ USEPA Office of Solid Waste Appendix IX RfD List (USEPA, 1987)
d/ PHRED - Public Health Risk Evaluation Data Base.

619/24

Table 6 Estimated Intake Levels from Dermal Contact/Ingestion Exposure to Viscose Basin Solid Wastes

Constituents	VB-9 Concentration	VB-9 Intake[a/]	VB-10 Concentration	VB-10 Intake[a/]	VB-11 Concentration	VB-11 Intake[a/]
	mg/kg	mg/kg/day	mg/kg	mg/kg/day	mg/kg	mg/kg/day
Arsenic[b/]	0.66	4.5×10^{-7}	12	9.4×10^{-6}	0.42	3.3×10^{-7}
Cadmium	--	--	8	1.4×10^{-5}	--	--
Carbon disulfide	70.	1.2×10^{-4}	--	--	15.	2.6×10^{-5}
Hydrogen sulfide	--[c]	--	--[c]	--	--[c]	--
Lead	32.	5.6×10^{-5}	--	--	42.	7.4×10^{-5}

Viscose Basins

a/ Equation 1.0 Equation Definition

Dermal Contact/Ingestion Intake = solid viscose waste concentration (weight fraction) x (skin surface (area of hands / body weight) x dust adherence x differential absorption factor

+ soil ingested / body weight x exposure frequency x exposure length

Equation 1.1 Adult Worker Intake Calculation: Carbon Disulfide

$$\text{Dermal Contact/Ingestion Intake} = 70 \times 10^{-6}\ \text{mg/mg} \times \left(\frac{870\ \text{cm}^2}{70\ \text{kg}}\right) \times 1.45\ \text{mg/cm}^2 \times 0.02$$

$$+ \frac{100\ \text{mg}}{70\ \text{kg}} \times \frac{365\ \text{days}}{365\ \text{day}} \times \frac{70\ \text{yr}}{70\ \text{yr}}$$

$$= 1.2 \times 10^{-4}\ \text{mg/kg/day}$$

AR304226

b/ Exposure frequency for arsenic is 250 days per year and exposure length is 45 year working lifetime because exposure for carcinogens is an averaged lifetime intake.

c/ Concentrations of hydrogen sulfide assumed to be below quantitation levels because pH is greater than 10 s.u.

619/25

Table 7 Estimated Intake Levels from Dermal Contact Exposure to Viscose Basin Liquid Wastes

Constituents	VB-9 Concentration	VB-9 Intake[a]	VB-10 Concentration	VB-10 Intake[a]	VB-11 Concentration	VB-11 Intake[a]
	mg/L	mg/kg/day	mg/L	mg/kg/day	mg/kg	mg/kg/day
Carbon disulfide	710	3.8×10^{-4}	320	1.7×10^{-4}	3431	1.8×10^{-3}
Hydrogen sulfide	--[b]	--	--[b]	--	--[b]	--
Phenols	14	7.4×10^{-6}	0.07	3.6 x 10-8	20	1.0 x 10-5

a/ <u>Equation 2.0 Equation Definition</u>

$$\text{Dermal Contact Intake} = \text{liquid viscose waste concentration} \times \frac{\text{skin surface area of hands}}{\text{body weight}} \times \text{water flux rate} \times \text{differential absorption factor}$$
$$\times \text{ exposure duration} \times \text{unit conversion} \times \text{exposure frequency} \times \text{exposure length}$$

<u>Equation 2.1 Adult Worker Intake Calculation: Carbon Disulfide</u>

$$\text{Dermal Contact Intake} = 710 \text{ mg/L} \times \frac{870 \text{ cm}^2}{70 \text{ kg}} \times 0.5 \text{ mg/cm}^2\text{-hr} \times 0.5$$
$$\times 0.17 \text{ hr/day} \times 10^{-6} \text{ L/mg} \times \frac{365 \text{ days}}{365 \text{ days}} \times \frac{70 \text{ yr}}{70 \text{ yr}}$$
$$= 3.8 \times 10^{-4} \text{ mg/kg/day}$$

b/ Concentrations of hydrogen sulfide assumed to be below quantitation levels because pH is greater than 10 s.u.

619/26

Table 8 Estimated Daily Intake Levels from Dermal Contact/Ingestion Exposure to Ground Water

Constituents	Maximum Concentration[a/] mg/L	Intake[b/] mg/kg/day
Arsenic [c/]	0.07	6.4×10^{-6}
Cadmium	0.032	6.6×10^{-6}
Carbon disulfide	360.	0.075
Hydrogen sulfide[d/]	9.2	1.9×10^{-3}
Lead	0.229	4.8×10^{-5}

a/ Maximum concentration in any well along east shoreline of Shenandoah River; September 1987 sampling

b/ Equation 3.0 Equation Definition

$$\text{Dermal Contact/Ingestion Exposure} = \text{ground water concentration} \times \left(\frac{\text{skin surface area}}{\text{body weight}} \times \text{water flux rate} \times \text{differential absorption factor} \times \text{exposure duration} \times \text{unit conversion} + \frac{\text{water ingested}}{\text{body weight}} \right) \times \text{exposure frequency} \times \text{exposure length}$$

Equation 3.1 Adult Worker Intake Calculation: Carbon Disulfide

$$\text{Dermal Contact/Ingestion Exposure} = 360\ \text{mg/L} \times \left(\frac{18150\ \text{cm}^2}{70\ \text{kg}} \times 0.5\ \text{mg/cm}^2\text{-hr} \times 0.5 \times 1.0\ \text{hr/day} \times \frac{10^{-6}\ \text{L}}{\text{mg}} + \frac{.01\text{L}}{70\text{kg}} \right) \times \frac{365\ \text{days}}{365\ \text{days}} \times \frac{70\ \text{yr}}{70\ \text{yr}}$$

$$= 0.075\ \text{mg/kg/day}$$

c/ Exposure frequency for arsenic is 250 days per year and exposure length is 45-year working lifetime because exposure for carcinogens is an averaged lifetime intake.

d/ Concentration of hydrogen sulfide is 1% of total sulfide concentration because pH is >9 s.u. This assumption is currently being assessed.

Using the daily exposure intake levels for a worker at the Avtex waste-treatment area, hazard indices for the noncarcinogens were calculated for the solid viscose waste, viscose liquid and ground water exposure pathways (Table 9). The hazard index is the ratio of the estimated intake levels to the Reference Dose (RfD). An index value less than one is an indication of an acceptable level of exposure or minimal risk. Hazard indices for the indicator chemicals were less than 1 for all three media (solid waste, liquid waste, and ground water (dermal contact)). The RfDs used to calculate the risks were for chronic or lifetime exposures; therefore, the hazard indices calculated are valued for a lifetime exposure of workers to the wastes and ground water (dermal contact).

The intake for arsenic was calculated as a exposure averaged over a lifetime, because cancer potency factors are determined on the basis of lifetime exposure. The upperbound lifetime excess cancer risk for a exposure to the solid waste or ground water (dermal contact) is 1.4×10^{-5} and 9.6×10^{-6}, respectively. The cancer risk associated with a 45-year working lifetime for combined dermal contact/ingestion exposure to both liquid and solid wastes and ground water is 2.4×10^{-5}.

Future Use Of Ground Water As A Potable Water Supply

Ground water used as a potable water supply would result in unacceptable intake levels. The total hazard index for drinking water exposure is 298. This value only represents the risk posed by oral intake and does not include the risk posed by the volatilization of these constituents in the home.

Drinking water exposure to the noncarcinogenic constituents presents an unacceptable level of human health hazard (See Table 9). For arsenic, the cancer risk associated with drinking ground water is 1.4×10^{-2} (See Table 9).

Surface Water Pathway

Flow of constituents in the shallow ground water to the Shenandoah River is occurring; however, shallow ground water flow during pumping of the recovery wells will be reversed and will flow toward the pumping wells.

A model was developed to estimate the total rate of shallow ground water discharge to the river, and the effects of this discharge on river water quality.

The rate of ground water discharge was calculated and estimated to be 111 ft^3/min or 1.2 million gallons/day (MGD) using the following Equation:

$$Q_{gw} = K_v i_v A$$

where:

Q_{gw} = the volume rate of discharge of ground water to the river

K_v = the vertical hydraulic conductivity

i_v = the vertical hydraulic gradient = .05

A = the area of concern over which the shallow ground water is discharging to the river = (X average width, 350 ft, by length of the river from the north end of Sulfate Basin 1 to the South end of Sulfate Basin 4, = 3500 ft)

AR304229

619/28

Table 9 Lifetime Risks Associated with Potential Exposure to Constituents Detected in the Viscose Basin Wastes and Ground Water

Noncarcinogens

Constituent	Chronic Daily Intake (CDI)				Reference Dose (RfD) mg/kg/day	Hazard Index b/			
	Solid Waste a/ mg/kg/day	Liquid Waste a/ mg/kg/day	Ground Water (Dermal) mg/kg/day	Ground Water (Ingestion) mg/kg/day		Solid Waste	Liquid Waste	Ground Water (Dermal)	Ground Water (Ingestion)
Cadmium	1.4×10^{-5}	--	6.6×10^{-6}	--	2.9×10^{-4}	0.048	--	0.023	--
Carbon disulfide	1.2×10^{-4}	1.8×10^{-3}	0.075	13 *	0.10	0.0012	0.018	0.74	130
Hydrogen sulfide	--	--	1.9×10^{-3}	0.48 *	0.003	--	--	0.63	160
Lead	5.6×10^{-5}	--	4.8×10^{-5}	--	1.4×10^{-3}	0.04	--	0.034	--
Phenols	--	1.0×10^{-5}	--	0.03	0.10	--	1.0×10^{-4}	--	0.3
Total Hazard Index						0.089	0.018	0.80	298

Carcinogens

Constituent	Chronic Daily Intake (CDI)				Cancer Potency Factor $(mg/kg/day)^{-1}$	Upperbound Lifetime Excess Cancer Risk			
	Solid Waste a/ mg/kg/day	Liquid Waste a/ mg/kg/day	Ground Water (Dermal) mg/kg/day	Ground Water (Ingestion) mg/kg/day		Solid Waste	Liquid Waste	Ground Water (Dermal)	Ground Water (Ingestion)
Arsenic	9.4×10^{-6}	--	6.4×10^{-6}	9.1×10^{-3}	1.5	1.4×10^{-5}	--	9.6×10^{-6}	1.4×10^{-2}

AR3042

a/ Highest intake levels from Viscose Basins 9, 10, or 11
b/ Hazard Index = CDI/RfD
c/ Cancer risk = CDI x potency factor
*/ Intake level does not represent the inhalation route due to volatilization in the home. It has been determined that this route could contribute a intake five times greater than this groun ter oral intake.

The rate of organic loading to the river from this area of affected ground water quality could then be calculated by multiplying the volumetric rate of ground water discharge to the river, Q_{gw}, by the average concentration of specific constituents in the shallow ground water. The ground water samples from PZ wells located along the river represent the shallow ground water.

The concentration of constituent X that would result in the river from shallow ground water discharge to that river, can be calculated using the following equation:

$$C(x)r = \frac{Q_r C(x)ro + Q_{gw} \quad C(x)_{gw}}{Q_r + Q_{gw}}$$

where: Q_r = the volumetric flow rate of the river

$C(x)_r$ = the concentration of constituent X in the river water

$C(x)ro$ = the concentration of constituent X in the river water prior to encountering the shallow ground water discharged in the vicinity of the plant

$C(x)_{gw}$ = the concentration of constituent X in the ground water

If it is assumed that the concentration of the constituent in the river is initially zero, before encountering the shallow ground water discharged from the vicinity of the plant, then Equation 3 is reduced to the following expression:

$$C(x)_r = \frac{Q_{gw}\, C(x)_{gw}}{Q_r + Q_{gw}}$$

and represents the change in river water quality that is attributable to the discharge to the river of shallow ground water in the vicinity of the plant. This calculation was performed for several inorganic constituents, assuming the volumetric flow rate of the river is 35 MGD, and the results of these calculations are presented in Table 10.

Air Pathway

Volatilization from basins 9, 10, 11 is probably resulting in the release of carbon disulfide to the atmosphere. However, concentrations of carbon disulfide were monitored in the air during drilling and sample collection at these three basins and the levels were always below the Threshold Limit Value (TLV) of 30 mg/m^3; with few exceptions, the hydrogen sulfide levels were below the TLV of 14 mg/m^3. Only when the surface was disturbed by drilling activities did levels exceed the TLV for hydrogen sulfide.

TABLE 10

CHANGE IN CONSTITUENT CONCENTRATIONS IN RIVER
DUE TO DISCHARGE OF GROUND WATER TO THE RIVER
(concentrations in mg/l)

Constituent	Average Concentration in PZ Wells	Change in Concentration in River	Virginia Surface Water Standards
Chloride	72	2.4	250
Sodium	1122	37	--
Zinc	0.01	0.00033	5.0
Sulfate	1900	63	250
Cadmium	0.0058	0.00019	0.01
Lead	0.058	0.0019	0.05
Arsenic	0.006	0.00019	0.05
Sulfide	7.8	0.25	a)

a) Concentration will be established based on the river water-quality evaluation that will be performed in 1988.

Fugitive dust releases from basins 9, 10, and 11 are expected to be low because a crust is formed at the surface of the waste. The crust has low concentrations of carbon disulfide (<0.1 mg/l).

Runoff from the basins is not significant because the wastes are permeable, and the waste basins have berms that extend above the waste levels.

VII. Documentation of Significant Changes

The Proposed Remedial Action Plan released on August 27, 1988, identified Alternative 3 which required construction of a new wastewater treatment plant (WWTP). Since that time Alternative 2 has been amended to include upgrading and modification of the existing WWTP. EPA does not consider this a significant change since the technology of pumping and treating ground water remains the same. At the public meeting on September 14, 1988, an addendum to the Proposed Plan was released explaining this modification.

VIII. Description of Alternatives

A. Summary of Alternatives

The three screened alternatives evaluated are summarized below.

Alternative	Water Monitoring	Institutional Controls	Basin Dewatering
1	X	X	
2	X	X	X
3	X	X	X

	Pump and treat in existing WWTP	Pump and treat Package Plant
1		
2	X	
3		X

B. Treatment Components

The options comprising the above alternatives are described below:

Monitoring - For all alternatives a ground water and surface water monitoring program will be implemented to monitor leachate generation and ground water quality and surface water quality. The data will be evaluated to determine if the parameters and/or sampling frequency should be modified.

Since Alternatives 2 and 3 include ground water recovery and basin dewatering, the recovery wells and the liquids from dewatering the basins would be included in the ground water monitoring program.

Ground water and surface water monitoring would be implemented to determine conclusively whether or not withdrawal from wells PW-1, 2, 3 is effective in managing the lateral and vertical migration of the plume.

Institutional Controls - institutional controls may include:

Ground water

- use restrictions to be obtained by site owners or operators from owners of property affected by the ground water remediation operable unit, prohibiting the construction of any water supply wells

- restrictions recorded in the Registry of Deed forbidding the installation of ground water wells on property at Rivermont acres owned by Avtex. These controls are expected to mitigate the risk from the potential exposure related to direct ingestion of ground water affected by the site until the aquifer restoration objective is achieved (see Section VIII on aquifer restoration).

Viscose Basins

For alternative 1, deed restrictions would be recorded in the appropriate Registry of Deeds forbidding the use of the viscose basins for anything but industrial purposes. Access restrictions currently used at the Avtex Fibers site include a security fence and a security guard at the plant entrance. Construction of a second fence around Viscose Basins 9, 10, and 11 would further restrict access to the viscose waste.

Basin Dewatering

Viscose Basins 9, 10, and 11 presently contain approximately 314,000 cubic yards of viscose solids with 90% water content, by weight, as well as an undetermined quantity of free water. The dewatering will result in approximately a 50% reduction in the viscose material and a great deal of contamination from the source area will be treated at the WWTP. In addition, dewatering acts to eliminate or reduce the hydraulic head within the basins, thus reducing the vertical gradient and hydraulic release to the underlying aquifer.

The rate of dewatering Viscose Basins 9, 10, and 11 will be dependent upon the WWTP's capacity to handle the hydraulic and contaminant loading from the dewatering operations. Based on the information presently available, it is perceived that the dewatering system for the basins would be installed at the western end of each viscose basin since the bottom of the basins slope to the west. The dewatering system may include modified wells and/or an extraction trench system. Final design and implementation would proceed based on the results of pilot studies which are presently underway.

It is expected that the dewatering of the viscose basins would be completed in two years based on a liquid recovery rate of 50 gallons per minute (gpm).

It will be necessary to evaluate the need for ground water table depression at the viscose basins; the effectiveness of dewatering will be evaluated after one year.

Bench scale studies on the dewatered waste will also be conducted to determine what final treatment of the dewatered waste is most appropriate.

Pumping and Treating

Both alternatives 2 and 3 require the recovery of contaminated ground water and collection of fluids from dewatering the basins, and assumes that the treated water will be discharged to the Shenandoah River in conformance with NPDES permit requirements. The action alternatives only differ in the methodology used to treat the recovered water to acceptable levels.

Pumping performed during the operation of interim measures and aquifer tests performed on the east side of the Shenandoah River have shown that the fracture system on both sides of the river are hydraulically connected and that there is some hydraulic separation of the fracture system from the river. The pump tests have shown the extraction of ground water from recovery wells PW-1, 2, and 3 is effective in capturing contaminated ground water on the west side of the river. A ground water monitoring program will be implemented to determine conclusively whether or not withdrawals from only these wells in effective in managing the lateral and vertical migration of the plume.

Existing WWTP following Pretreatment

Pretreatment options include the equalization of the recovered ground water and the viscose basin fluid in an equalization tank. Aeration in the equalization tank will be adequate to remove excess carbon disulfide from solution; a portion of the total sulfides will also be removed as hydrogen sulfide via aeration. EPA in consultation with the Virginia Air Pollution Control Board will determine if any pollution control devices will be necessary at the WWTP due to releases of carbon disulfide and hydrogen sulfide.

A neutralization process follows to adjust pH value to 6.5 - 7.0. Chemical precipitation in an acidic environment will remove the insoluble sulfides of cadmium, arsenic, and lead. Bench and/or pilot studies will be required to verify the appropriate treatment scheme prior to design of an effective treatment program. The recovered waters are then transferred to the existing WWTP for further treatment. The WWTP process consists of primary sedimentation followed by mechanically aerated activated sludge and final clarification. The primary sedimentation process is enhanced by lime addition to neutralize the acidic waste stream and precipitate zinc. This process will also precipitate arsenic, cadmium, lead, and other heavy metals.

It is anticipated that the sludge will not be EP toxic and therefore may be disposed on site. Testing will be required and if found to be EP toxic, the sludge will be disposed in a RCRA-approved landfill. If RCRA Land Ban requirements are applicable, sludge will require treatment before disposal. The NPDES-permitted effluent is discharged to the Shenandoah River.

Package Activated Sludge Wastewater Treatment Plant

A package activated-sludge wastewater treatment plant could be utilized to treat the recovered ground water and liquids generated from dewatering and leachate collection from the viscose basins. The package plant design would be similar to that of the existing WWTP since it has been proven effective for the constituents of concern and will be designed to comply with all RCRA regulations. Biological treatment is considered by EPA to be the best available technology for viscose waste treatment (40 CFR 414). The waste stream would require pH stabilization at the plant influent and the means for sludge disposal. The process options required before biological oxidation are those discussed previously under the pretreatment options.

As stated previously, sludge will be tested for EP toxicity. If toxic, disposal will be in an approved RCRA landfill. If RCRA land ban applies, sludge will require treatment before disposal. Also, the Virginia Air Pollution Control Board will determine if any pollution control devices will be necessary to abate releases of carbon disulfide and hydrogen sulfide from the aerators.

C. Implementation Timeframe

The estimated remedial action timeframes for each of the alternatives are summarized below:

Alternative	Time to achieve aquifer restoration	Time to dewater waste	Comments
1	N/A	N/A	Will not achieve aquifer restoration
2	unknown	2 years	Once the source of the ground water contamination in completed remediate time will be estimated. Basin dewatering and pumping could commence following construction of pretreatment options. Construction is estimated at 1 1/2 to 2 years. FS cost based on 30 years O&M.

3	unknown	2 years	Time can be estimated once the source is remediated. FS costs based on 30 years O&M. Construction time for package plant is estimated at 2 years.

D. Description of Major ARARs for Selected Remedy

Chemical Specific ARARs for Ground Water Pumping

The following table lists cleanup criteria proposed for chemicals of concern that will be treated and monitored.

These ARARs are based on values derived from the following: MCLs from the Federal Drinking Water Standards, EPA Reference Dose-based water limits, Federal Ambient Water Quality Criteria and Virginia State Drinking Water Standards. These are based on identifying the aquifer of concern as equivalent to a Class II aquifer.

Chemical Specific ARARs

Parameter (mg/l)	ARAR	Method/Source
carbon disulfide	.7	RfD
hydrogen sulfide	TBD	(1)
sulfide	TBD	(1)
phenol	.3	AWQC
cadmium	.01	MCL
lead	.05	MCL/VAGWS
arsenic	.05	MCL/VAGWS
zinc	5	AWQC/VAGWS

MCL-Maximum Contaminant Level

RfD-EPA Reference Dose-based water limit, assuming 20% contribution from drinking water

(1)-Cleanup level based on further characterization of site background

VAGWS-Virginia Ground Water Standard

AWQC -Ambient Water Quality Criteria based on organoleptic effects.

Clean-up criteria would be applied to ground water quality monitored at both the recovery and monitoring wells. The operation of the ground water recovery and treatment system may be discontinued when all ARARs for ground water are attained. The pump and treatment system would be reactivated if the concentration of indicator chemicals shows a significant increase above the clean-up criteria in two consecutive quarters.

Performance Criteria ARARS for Ground Water and Basin Fluid Treatment

On-site discharges from CERCLA sites to surface waters are required to meet the substantive CWA NPDES requirements, including discharge limitations, monitoring requirements, and best management practices. State Water Control Board Regulation 6: NPDES Permit Program, Federal water quality criteria and State surface water quality standards are also applicable.

Chemical Specific Water Quality ARARs (in ppb)

Regulation	Arsenic	Cadmium	Lead	Zinc	Phenolics	Hydrogen Sulfide
			Parameter			
		Human Health Protection				
1. CWA Fish and water	0.0022*	10	50	5000+	3500	-
2. CWA Water Only	0.0025*	10	50	5000+	-	-
3. CWA Fish Only	0.0175*	-	-	-	-	-
4. VA Surface Water	50	10	50	5000	1	-
		Aquatic Life Protection				
5. CWA Freshwater Acute	360**	3.9	82	120#	10200	-
6. CWA Freshwater Chronic	190**	1.1	3.2	110#	2560	-
7. VA Freshwater	190**	3.2	16.8	47	1	2

* Risk level of 1 in a million is presented
** Criterion is for trivalent form of arsenic
\+ Organoleptic criterion
\# Hardness-based criterion, calculated using a value of 100 mg/l

1. Clean Water Act, criteria based on ingestion of fish and water.
2. Clean Water Act, criteria based on ingestion of water only.
3. Clean Water Act, criteria based on ingestion of fish only.
4. Virginia Surface Water Standard for Public Water Supply.
5. Clean Water Act, criteria for protection of freshwater organisms from acute toxicity.
6. Clean Water Act, criteria for protection of freshwater organisms from chronic toxicity.
7. Virginia water quality criteria for surface water, freshwater organisms.

Land Disposal ARARs

If sludge is found to be EP toxic, Hazardous Waste Requirements (RCRA Subtitle C, 40 CFR, Part 264) is an ARAR. If sludge is EP toxic to levels that would trigger RCRA Land Ban requirements, then Land Disposal Restrictions (RCRA Subtitle C, 40 CFR, Part 268) is an ARAR. Then, sludge will require treatment prior to disposal.

Performance Criteria ARARs for Air Emissions from Remedial Activities

- OSHA Requirements (29 CFR Parts 1910, 1926, and 1904) - OSHA regulations provide occupational safety and health requirements applicable to workers engaged in onsite field activities. Threshold limit values (TLVs) refer to airborne concentrations of substances and represent conditions under which it is believed that workers may be repeatedly exposed without adverse effects.

- Virginia Air Pollution Control Board Regulations for control and abatement of air pollution, Subsection 120-05-0300 for new or modified facilities. Remedial actions will result in emissions of carbon disulfide and hydrogen sulfide. The standard for non-criteria pollutants (non-carcinogens) is based on the threshold limit value - time weighted average (TLV-TWA) for that pollutant divided by a factor of 60 (see Section 120-05-0300), and is applicable at the site boundary for emissions resulting from the treatment of groundwater and basin fluids.

Location Specific ARARs

Executive Order 11988, Floodplain Management (40 CFR Part 6, Appendix A). This order requires Federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, adverse effects.

Executive Order 11990, Protection of Wetlands (40 CFR Part 6, Appendix A). This order requires Federal agencies conducting certain activities to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exist.

The site is located in the 100 year floodplain. Wetlands also have been identified in the area of concern. However, EPA believes that the remedial action proposed for Operable Unit 1 will not adversely impact the floodplains or wetlands.

E. Description of the Preferred Alternative

EPA's preferred alternative differs from the alternative recommended by Avtex and FMC, as discussed in the FS report.

While the ground water remediation component of the alternatives EPA evaluated in the Proposed Remedial Action Plan are similar to those alternatives evaluated in the RI/FS, the alternatives EPA evaluated differs from all five alternatives analyzed in the RI/FS. This is because EPA and the Virginia Department of Waste Management (DWM) determined that additional studies were required to fully evaluate the effects dewatering the waste viscose basins has on the toxicity of the waste, and the volume of waste requiring treatment.

EPA's preferred alternative for Operable Unit One is comprised of the following:

- the use of existing on-site pumping wells numbers 1, 2, and 3 to pump and recover the contaminated ground water;

- installation of modified wells or extraction trenches in Viscose Basins 9, 10 and 11 for dewatering operations;

- pumping and treatment of contaminated ground water and basin liquid in the existing on-site activated sludge WWTP following necessary upgrades, modifications and construction of pretreatment units;

- periodic monitoring of on-site and off-site ground water, surface water, and basin fluids throughout the operation and maintenance; and

- placement of deed restrictions prohibiting the use of ground water on the affected properties.

Basin dewatering is an interim measure required before any treatment of the waste could be implemented. Based on the information gathered in the remedial investigation, basin dewatering should reduce the toxicity of the basin material significantly; however, it is unknown if basin dewatering will be effective in the deeper portions of the basins. The total reduction in toxicity via dewatering and natural degradation can only be assumed. EPA therefore recommends that the decision of the preferred final treatment of the waste be deferred until more is known about the characteristics of the dewatered waste. Concurrent with the dewatering of the waste, EPA has recommended that a focused feasibility study to include bench-scale studies on dewatered waste and treatability studies be conducted to determine: 1) the toxicity of the viscose waste following the dewatering, and 2) the technology most effective to treat the remaining volume of hazardous waste.

IX. Summary of Comparative Analysis of Alternatives

A summary of the comparative analysis of alternatives is provided in the following table. Costs included in the table are estimates only.

Comparison of Remedial Alternatives
Avtex Fibers, Inc.
Front Royal, Virginia

Remedial Alternatives Operable Unit 1

	Alternative 1	Alternative 2	Alternative 3
Screening Criteria	No Action GW	GW to Existing WWTP Dewater Viscose Basins	GW to package WWTP Dewater Viscose
Basins			
Short-term Effectiveness	Does not mitigate potential risks due to ingestion of ground water	Effectively minimizes potential future risk due to ingestion of ground water	Effectively minimizes potential future risk due to ingestion of ground water

	Alternative 1	Alternative 2	Alternative 3
Screening Criteria	No Action GW	GW to Upgraded Existing WWTP Dewater Viscose Basins	GW to package WWTP Dewater Viscose Basins
	Minimal risk to workers	Moderate risk to workers while installing dewatering system	Moderate risk to workers while installing dewatering system
Long-term Effectiveness	Potential risk due to ingestion of ground water not mitigated Minimal O&M required for security fence	Potential risk due to ingestion of ground water minimal	Potential risk due to ingestion of ground water minimal
Reduction of Toxicity, Mobility and Volume	Ground water in not affected; still remains a potential threat	Low O&M required for GW recovery and basin dewatering	Low O&M required for GW recovery and basin dewatering
	Toxicity and volume of viscose waste not affected	Toxicity, mobility and volume of ground water permanently and significantly reduced Toxicity and volume of viscose waste reduced due to dewatering	Toxicity, mobility and volume of ground water permanently and significantly reduced Toxicity and volume of viscose waste reduced due to dewatering
Implementability	Utilizes conventional construction methods Future remedial actions not precluded by the current action	Utilizes conventional construction methods Future remedial actions not precluded by the current action	Utilizes conventional construction methods Future remedial actions not precluded by the current action
Capital and O&M Cost (Present Worth)	$603,000	$9,122,000 *	$15,421,000*
Compliance with ARARs	Does not meet ARARs in aquifer	Would meet ARARs in the aquifer and discharge ARARs	Would meet ARARs in the aquifer and discharge ARARs

* If air pollution control devices are required at WWTP, cost will inc

Screening Criteria	Alternative 1 No Action GW	Alternative 2 GW to Upgrade Existing WWTP Dewater Viscose Basins	Alternative 3 GW to package WWTP Dewater Viscose Basins
Overall Protection	Does not protect against future ingestion of ground water	Risk form potential exposure to ground water will be minimized while aquifer is being restored	Risk from potential exposure to ground water will be minimized while aquifer is being restored

The Selected Remedy

Section 121 of SARA and the National Contingency Plan (NCP) establishes a variety of requirements relating to the selection of remedial actions under CERCLA. Having applied the current evaluation criteria to the three remedial alternatives, EPA recommends that Alternative 2 be implemented at the Avtex Fibers Site. This alternative is recommended with the following considerations:

1) the proposed upgrading of the existing WWTP will bring the plant into steady compliance and

2) treatability studies will conclusively demonstrate that the upgraded plant will have the capability to treat the recovered ground water and basin fluids.

Alternative 3 will be the contingency plan should the use of the existing WWTP be excluded.

This is an operable unit remedy for the site and as such does not attempt to ensure compliance with all ARARs for the entire site. It will be consistent, however, with those action-specific ARARs addressing the ground water remediation. This operable unit remedy will not be inconsistent with a final comprehensive remedy for the source (waste viscose).

The No-Action Alternative is not protective of human health or the environment and does not meet ARARs; therefore, the No-Action Alternative will not be considered for this site. Alternative 2 will be protective of human health and the environment and attains all applicable or relevant and appropriate requirements identified for this operable unit. The selected alternative can be operational in approximately two years. Final treatment of the source will not be directly addressed in this operable unit.

Point of Compliance

The point of compliance for ground water remediation will be the recovery wells and the monitoring wells on site.

Preference for Treatment as a Principal Element

The selected remedy involves pumping and treatment of ground water to address the principal threats posed by ground water contamination. It will also involve extraction and treatment of basin fluids as an interim measure. This will reduce the toxicity of the viscose material and its volume. The ROD for the treatment of the Viscose Waste will address in its entirety remediation of threats to ground water, air and surface water caused by the viscose basins.

Risk Level To Be Attained

When the aquifer restoration goals are attained, the hazard index for ingestion of ground water will be less than 1 for the non-carcinogen contaminants in the ground water. With respect to arsenic, the cancer risk will be that risk associated with the EPA Primary Drinking Water Standard of 0.050 mg/l which is a calculated cancer risk of approximately 10^{-3}.

Statutory Determinations

Protection of Human Health and the Environment

The selected remedy will provide adequate protection of human health and the environment by managing the migration of the contaminant plume and by recovering the contaminated plume for treatment. Institutional controls will also protect by prohibiting the installation of wells for potable water on the east side and the west side of the river. The alternative will not pose any unacceptable short term risks or cross-media impacts.

Attainment of the Applicable or Relevant and Appropriate Requirements

The selected alternative will be consistent with those chemical and action and location specific ARARs detailed in Section D - Description of Major ARARs.

1. The selected alternative attains the chemical specific ARARs identified on pages 27 and 28. (Applicable)

1. RCRA Subtitle C, Land Disposal Requirements in 40 CFR 264 and RCRA Subtitle C Land Disposal Restrictions in 40 CFR 268 which address disposal of hazardous waste. (Applicable if sludge from wastewater treatment plant is found to be EP toxic.)

2. Executive order 11988, Protection of Flood Plains and Executive order 11990, Protection of wetlands. (Applicable) Groundwater pumping and basin dewatering will not impact the floodplain or the wetlands identified on site.

3. CWA NPDES Permit Requirements, VA Water Discharge Permit Regulations which govern the dischares to navigable waters. (Applicable)

4. OSHA Requirements (29 CFR Parts 1910, 1926, and 104). Provides occupational safety and health requirements applicable to workers engaged in onsite field activities. (Applicable)

5. VA Air Pollution Control Board Regulations for control and abatement of air pollution, Subsection 120-05-0300. (Applicable)

Cost Effectiveness

The selected remedy, Alternative 2, is more cost effective than Alternative 3 in that it will provide the same level of protection as Alternative 3 but can be implemented at a savings estimated at $6.0 million.

Preference for Treatment as a Principal Element

The selected remedy involves pumping and treatment of ground water to address the principal threats posed by the Groundwater Operable Unit. It will also involve extraction and treatment of basin fluids as an interim measure. This will reduce the toxicity of the viscose material and its volume. The ROD for the treatment of the viscose waste (second operable unit) will address in its entirety remediation of threats to ground water, air and surface water caused by Viscose Basins 9, 10 and 11.

RESPONSIVENESS SUMMARY
FOR THE
PROPOSED REMEDIAL ACTION, OPERABLE UNIT 1
AT THE
AVTEX FIBERS SUPERFUND SITE
FRONT ROYAL, VIRGINIA

September 28, 1988

Prepared for:

U.S. Environmental Protection Agency
Region III

Prepared by:

Booz, Allen & Hamilton Inc.
Under Subcontract Number TESK-TEAM-013, WA Number 1075
with CDM Federal Programs Corporation

AR304245

RESPONSIVENESS SUMMARY
FOR THE
PROPOSED REMEDIAL ACTION, OPERABLE UNIT 1
AT THE
AVTEX FIBERS SUPERFUND SITE
FRONT ROYAL, VIRGINIA

TABLE OF CONTENTS

RESPONSIVENESS SUMMARY
FOR THE PROPOSED REMEDIAL ACTION, OPERABLE UNIT 1
AT THE AVTEX FIBERS SUPERFUND SITE
FRONT ROYAL, VIRGINIA

I. INTRODUCTION

In accordance with the U.S. Environmental Protection Agency's (EPA) community relations policy and guidance, the EPA Region III Office held a public comment period from August 24, 1988, to September 26, 1988, to obtain comments on the proposed remedial action for Operable Unit 1 at the Avtex Fibers Superfund site in Front Royal, Virginia. Operable Unit 1 encompasses the contaminated ground water at the site. On September 14, 1988, EPA held a public meeting to explain the Proposed Remedial Action Plan (PRAP) and to obtain public comments on the proposed remedy. Approximately 80 community residents and interested persons attended the meeting. Copies of the PRAP were distributed at the meeting and were placed in the information repository/administrative record for the site.

The purpose of the Responsiveness Summary is to document questions and comments raised during the public comment period and EPA's responses to them. Section II, immediately following, summarizes the presentations made at the public meeting on September 14. Section III presents a summary of the questions and comments expressed by the public at the meeting. Section IV then contains a summary of written comments received during the public comment period. The questions and comments are grouped into general categories, according to subject matter. All questions or comments are followed by EPA's responses.

This document was prepared by Booz, Allen & Hamilton Inc., a subcontractor to CDM Federal Programs Corporation, under contract to U.S. EPA Region III to provide community relations services.

II. SUMMARY OF MEETING PRESENTATIONS

A. Purpose of Meeting and Meeting Introduction

Colleen Leyden, the U.S. EPA Region III Community Relations Coordinator for the Avtex Fibers Superfund site, welcomed meeting attendees. She explained that the public meeting was being held during the public comment period on the proposed remedy for the contaminated ground-water portion of the Avtex Fibers Superfund site, which will be Operable Unit 1 of a two-phased action. The meeting was to fulfill two purposes: 1) to inform the community of EPA's proposed remedial action for Operable Unit 1, and 2) to obtain public comments on the proposed remedy. She introduced speakers and other State and EPA personnel.

Ms. Leyden pointed out that EPA had amended its proposed remedial action, as originally described in the PRAP distributed to the community in late August 1988. The PRAP had recommended Alternative 3, pumping of contaminated ground water and treating it in a newly constructed wastewater treatment plant. Since the PRAP was written, however, Avtex Fibers had proposed to upgrade the existing wastewater treatment plant at the site. EPA, therefore, now recommends Alternative 2, as amended -- pumping of contaminated ground water and treatment in the existing wastewater treatment plant, which will be upgraded to meet applicable standards. Ms. Leyden explained that this change was outlined in the PRAP Addendum, distributed at the meeting (see Attachment 2).

Ms. Leyden then stated that the Superfund program was established to address abandoned hazardous waste sites, and cannot be used to take action at currently operating facilities. She also explained that the Superfund program undertakes two kinds actions to respond to hazardous waste problems. The first type is a "removal" action, which is a short-term response taken to clean up immediate problems. The second type is a "remedial" action, designed to address long-term hazardous waste threats; the actions planned for the Avtex site fall under the remedial category. The Avtex actions will be conducted in two phases: the first, Operable Unit 1 now under consideration, will address ground-water contamination; the second, Operable Unit 2, will address the viscose basins and will be undertaken in the near future.

B. Site Background and the Proposed Plan

Ruth Rzepski, the EPA Enforcement Project Manager for the site, briefly outlined the Avtex Fibers site history. The plant was built in 1940 to manufacture rayon. It has operated continuously under the ownership of several firms, including Avtex Fibers, Inc., the current owner. In 1982, tests showed the presence of carbon disulfide and phenols in some local private wells. The site was proposed for EPA's National

AR304248

Priorities List (NPL), the list of nationwide hazardous waste sites eligible to receive Federal funds for long-term cleanup, and was officially added to the list in 1986.

Ms. Rzepski explained that after a site is placed on the NPL, EPA identifies and negotiates with the parties who contributed to the problem, called potentially responsible parties (PRPs), to pay to study and clean up the site. EPA began negotiations with with Avtex Fibers, Inc. and, in 1987, entered into an Administrative Order with the firm to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the site. An RI/FS is a Superfund activity that determines the extent of contamination present at a hazardous waste site and evaluates possible actions to address the problem. EPA concurrently negotiated with FMC Corporation, another PRP, and in January 1988, amended the Administrative Order to include FMC. The RI was conducted between May 1987 and January 1988.

Ms. Rzepski briefly outlined the findings of the RI. The viscose basins were tested and monitoring wells installed to sample the ground water. From data gathered, it was determined that Viscose Basins 9, 10, and 11 are contaminating the ground water. The hazardous substances of concern found during site sampling were summarized in a list distributed at the meeting (see Attachment 1). Substances from the basins are migrating through fractures in the bedrock and contaminating wells across the Shenandoah River from the Avtex site. Viscose, which is heavier than water, sinks to bedrock level and into cracks, moves under the river, and contaminates ground water on the far side; the Shenandoah River is not greatly affected by the contaminated ground water.

EPA had originally evaluated three remedial alternatives to address the ground-water contamination at the Avtex site, Ms. Rzepski explained. The first was the "no-action" alternative, which would involve construction of a fence to prevent site access but no actions to clean up the ground water; EPA regulations require that this alternative be considered for all Superfund sites. Alternative 2 involved pumping and treating the contaminated ground water using the existing wastewater treatment plant. Alternative 3 involved pumping and treating the contaminated ground water using a newly constructed wastewater treatment plant. After these alternatives had been published, however, Avtex Fibers, Inc. recommended modifying Alternative 2 by upgrading the existing wastewater treatment plant to meet applicable standards.

Ms. Rzepski explained that, after careful consideration, EPA is now recommending Alternative 2, with upgrades. AR304249 Alternative 2 as now proposed can be implemented faster than Alternative 3, and should prove equally effective after upgrades are completed. If Alternative 2 is found not to be treating ground water properly, Alternative 3 will be implemented.

Ann Cardinal, head of the EPA Region III Community Relations Staff, provided additional information. In making its decision on a remedy for the site, EPA will take into consideration all public comments received during the comment period. After a remedy is selected, EPA will publish a notice in local newspapers explaining the remedial action that will be taken to address the contaminated ground water.

Ms. Cardinal also explained that, once a remedial alternative is selected for the Avtex Fibers site, EPA will enter into negotiations with the PRPs to design and implement the remedy. She cautioned that it will take some time to begin actual construction of the remedy; it cannot begin immediately because it will take some time to design properly.

III. PUBLIC MEETING COMMENTS

A. Recommended Alternative

1. One questioner asked whether either Alternative 2 or 3 represents a state-of-the-art treatment technology that can be relied upon to function properly. She also asked who will determine the effectiveness of the remedy and how long the pumping and treating will continue.

   EPA Response: The treatment technology that will be implemented under Alternative 2, as amended, is the recommended method to treat viscose waste. If the existing wastewater treatment plant, after being upgraded, cannot comply with its State discharge permit, Alternative 2 will be terminated and be replaced by Alternative 3. Thus, a new wastewater treatment plant will be constructed. EPA will work closely with the State to determine the upgraded plant's effectiveness, and the permit under which the plant will be operating will be issued by the State. The State will help to determine the technical and economic feasibility of the plant's operation.

   The wastewater treatment plant will continue to operate until the contaminated ground water is cleaned up; at this time it is impossible to determine how long that will be.

2. A community resident requested information on the locations of the ground-water monitoring wells installed during the RI/FS, and asked whether they will continue to operate during the Remedial Design and Remedial Action. He specifically asked if ground water will be monitored on the east side of the Shenandoah River.

   EPA Response: The locations of the monitoring wells are indicated on the map distributed at the meeting (see Attachment 1). These wells are located on both the east and west sides of the river. The wells will continue to operate throughout the remedial action until ground water reaches target levels.

3. A meeting attendee asked whether EPA will monitor neighboring "clean" areas during pumping to determine whether removing large amounts of water will contaminate those areas, or whether pumping will force contaminated ground water into the Shenandoah River.

   EPA Response: The dynamics of the pumping will make it almost impossible to disperse contaminated grou water into areas that are currently clean. Ground water tends to flow from higher to lower levels. Because of the pumping action, which will extract large amounts of water, ground water near the pumping well will be at a lower level than the surrounding areas. Thus, the pumping would tend to pull cleaner water toward the contaminated areas and dilute the substances present, rather than force contamination toward purer areas. Pumping tests have indicated that this will occur and EPA is confident that that pumping will not further disseminate contaminants.

Similarly, tests have shown that it is unlikely that contaminated ground water will be forced into the Shenandoah River by the pumping. Some minor leakage may occur from the river to the ground water; however, because the river-water quality is higher than the water in the plume, this would improve the quality of the ground water rather than further degrade it.

4. The same attendee asked how deep the ground-water pumping wells will be; how EPA will dispose of the treated ground water; and whether EPA will install additional monitoring wells during the Remedial Action.

   EPA Response: The wells used to pump ground water will be 150-175 feet deep. After treatment is completed, the water will be discharged into the Shenandoah River. At this time, EPA is in the process of determining whether to drill more ground-water monitoring wells, although the existing wells have functioned adequately for nearly two years.

5. The same individual then asked whether Geraghty & Miller, who performed the RI/FS, will conduct the Remedial Design and Remedial Action at the Avtex site.

   EPA Response: The decision of a Remedial Design and Remedial Action contractor will be made by the PRPs. EPA does not yet know which firm will be used.

6. One individual asked what role the Virginia State Water Control Board will have in monitoring the wastewater treatment plant.

   EPA Response: The Water Control Board will set the discharge limits that the plant must meet. The Water Control Board, using State personnel, will also monitor the plant's discharge levels.

B. Costs of Remedial Action

1. One attendee pointed out that Alternative 2, if selected, will require approximately $10.2 millio implement according to the PRAP cost estimates. He

asked EPA to explain how much of this money will be spent during the first two to three years of the remedy, and how much will be required thereafter. He also stated that reports in the information repository indicate that approximately 40 percent, or $4 million, will be used during the two to three years for start up and the remaining $6.2 million in later years.

EPA Response: The estimated cost for Alternative 2, as shown in the PRAP Addendum, is now $9.1 million, representing a difference of approximately $1.1 million from the $10.2 figure originally quoted. At this time it is not possible to state precisely how much money will be spent on the remedy during its first years of operation. After the existing wastewater treatment plant is upgraded to comply with applicable treatment standards, most of the remainder of the money will be used for operation and maintenance of the plant.

Reports on file in the information repository do estimate that roughly 40 percent of the remedial implementation funds will be spent during the first two or three years of the remedy, with the remainder being used throughout the life of the cleanup action. These figures, and those shown in the PRAP, are estimates of present-worth costs in today's dollars. Actual costs are likely to vary depending on numerous factors such as inflation.

2. Another meeting attendee asked whether Avtex Fibers, Inc. will be expected to bear the entire cost of the remedial action itself, or whether other firms will share them.

   EPA Response: That is still to be determined. There are currently two signatories to the Administrative Order under which the RI/FS was conducted: Avtex Fibers, Inc., and FMC Corporation. That agreement, however, covered only the investigation and planning phase of site response. There will be a second round of negotiations with the PRPs to determine whether they will pay for the Remedial Design and Remedial Action.

C. General Questions

1. One County resident asked whether EPA has investigated or plans to investigate reports of Dupont's disposal of wastes into the City sewer system. AR304253

   EPA Response: It is likely that any disposal o wastes into the City sewer system would primari affect the Shenandoah River. Operable Unit 1, is the subject of this public comment period, deals only with ground-water contamination, not with the river. In addition, Superfund cannot address problems associated with discharging substances into permitted municipal treatment plants; problems of this type are regulated under other laws.

2. A meeting participant asked whether public comments received during the comment period will be considered when EPA selects the remedy.

   EPA Response: All comments that EPA receives during the designated public comment period are reviewed and considered equally in EPA decisionmaking. Only EPA and State comments receive added emphasis. After the public comment period is completed, all comments will be summarized in a document called a Responsiveness Summary, which will be attached to the decision document for the Avtex site.

3. One attendee read into the meeting minutes a prepared statement that voiced dissatisfaction with all of the alternatives considered for the Avtex site. She cited environmental problems reportedly caused by Avtex Fibers, Inc., especially air emissions and dumping wastes into the river, and stated that she would like the plant to be closed.

   EPA Response: EPA is sometimes in the position of improving the environment without closing important economic resources. It will take many millions of dollars for EPA to clean up the environment; environmental problems have taken years to create and they will take years to clean up. Thus, EPA must proceed in a step-wise fashion. Although EPA has more than $8 billion to clean up abandoned hazardous waste sites, it will actually take many times that amount to address just the sites that are known. EPA is required by necessity and by law to conserve the Trust Fund as much as possible. It must work with economically viable industries, such as Avtex, toinvestigate and clean up the problems that they have helped to create. Avtex is cooperating with EPA to address the contamination present.

4. Several attendees voiced their concern about general environmental problems and attitudes. One stated that EPA is not generally complying with the National Environmental Protection Act (NEPA), which is a law passed to protect, preserve, and restore the environment. Another stated that the National Pollution Discharge Elimination System (NPDES) permitting process, under which the Avtex wastewater treatment plant will operate, is a license to pollute.

AR304254

EPA Response: NEPA is a goal toward which EPA strives. The U.S. has progressively tried to address different environmental problems with the successive passage of the Clean Air Act in 1970, the Clean Water Act in 1972, the Resource Conservation and Recovery Act in 1976, and Superfund in 1980. The magnitude of the problems that EPA must address, however, is large and it is impossible to succeed completely immediately. It is, therefore, necessary to institute such programs as NPDES. However, the purpose of this meeting is to discuss issues specific to the Avtex site. These comments are outside the scope of our current purposes, and will be more appropriately referred to Congress for consideration.

IV. WRITTEN COMMENTS

A. Citizen Comments

1. **In separate coments, a Rivermont Acres property owner and a Fiddler's Green property owner expressed concern over the quality of ground water in the subdivisions. One of these residents also indicated that the quality of the ground water had been poor since 1966.**

   EPA Response: The Virginia State Water Control Board in 1982 detected ground-water contamination in private wells located in the Rivermont Acres subdivision across the Shenandoah River from Avtex, and requested that Avtex Fibers, Inc. perform ground-water studies. Upon completion of these studies, Avtex undertook measures to address the contamination, measures that included the purchase of most subdivision properties and ground-water pumping and treatment. Through the Virginia State Water Control Board, EPA also became aware of the ground-water problem in 1982, a problem that will be addressed and eventually remediated through Alternative 2, the preferred alternative. EPA records indicate that no wells within the contaminated plume are being used to provide drinking water.

2. **One resident asked who will be responsible for enforcing cleanup activities at the Avtex Fibers site.**

   EPA Response: Once the ROD is signed, negotiations will begin with the potentially responsible parties (PRPs) associated with the Avtex Fibers site. EPA will seek to have the PRPs implement the Remedial Action. If negotiations are successful, EPA would enter into an agreement with the PRPs. If negotiations are unsuccessful, EPA would either perform the remedial work itself and then attempt to recover these costs from the PRPs, or could begin legal proceedings to force the PRPs to perform all necessary actions.

3. **A citizen was concerned that only two wells on the west bank of the Shenandoah River would be used to monitor ground-water quality on the river's west side. He was also concerned that no wells further southwest had been tested, and worried that the contaminant plume may have migrated past the ridgeline southwest of Rivermont Acres. He suggested that his well be sampled along with the other two wells.**

   AR304256

   EPA Response: EPA will require the monitoring of ground water on the west side of the river; however, the number and locations of these wells has yet to be determined.

EPA has asked the companies who have entered into the Administrative Order to sample three additional wells, which are located southwest of the Rivermont Acres subdivision, for indicator chemicals. These wells are Numbers 187, 199, and 201, and were chosen because of their location along the bedrock and their depth to an elevation near 430 feet mean sea level. If contamination has migrated this distance, EPA would expect to find the contaminants at or near 430 feet mean sea level.

B. Avtex Fibers, Inc. Comments

1. Avtex Fibers commented that they agree with Alternative 2 as proposed in the Addendum to the PRAP, issued on September 14, 1988.

   EPA Response: EPA appreciates the concurrence of Avtex Fibers, Inc. on Alternative 2, the preferred remedial alternative.

C. FMC Issues

1. The "Two-Stage Process" is inappropriate.

   EPA Response: The Agency has the authority to split remediation into operable units. Because EPA does not know the concentrations of hazardous substances which will remain in the viscose basins after dewatering, the operable unit approach to this remediation is appropriate. EPA has recommended the pumping and treating of ground water and basin fluids. After that has been completed, the toxicity of the viscose basins will be determined.

   The comment by FMC that they have proposed capping the basins during the dewatering process is in error. Page 4-14 of the FS Report dated August 26, 1988, states, "After dewatering, a 2 to 4 foot soil cap would be placed on top of the basins." The statement by the commentor that a soil cap be placed on the viscose basins during the dewatering is not acceptable, since this suggests leaving the dewatered viscose waste in place without treating the remaining hazardous waste.

   Furthermore, data in the RI are not sufficient to support the conclusion that the concentrations of hazardous substances in the viscose basins will decrease significantly with time, and that the concentrations of these substances remaining after dewatering will not present a significant threat to human health and the environment.

FMC was given notice during an August 19, 1988, meeting with EPA, and by a letter dated August 23, 1988, confirming the substance of that meeting, that it was necessary to obtain additional information about the hazardous substances in the viscose basins and effective treatment methods for the viscose basin materials after dewatering.

2. **The PRAP may mischaracterize FMC's responsibilities.**

EPA Response: The FS Report submitted to EPA by Avtex Fibers, Inc. and FMC Corporation on August 26, 1988, proposed modifying and upgrading the existing wastewater treatment plant (WWTP). On page B-11, it states, "The existing plant must be modified to attain compliance with existing and future NPDES permits... General maintenance and upgrading of the aeration basins and clarifiers would also increase the removal efficiency of the existing WWTP." Also on page B-15 of the FS Report, $1 million has been estimated for modifications to the existing WWTP. Therefore, it is not misleading to state in the Addendum to the PRAP that Avtex Fibers, Inc. and FMC Corporation proposed updating the existing plant.

Based on the cost estimates for the Remedial Action presented in the FS Report, it was considered more cost-effective to bring the existing WWTP into compliance with existing and future NPDES permit requirements. Therefore, upgrading and modifying the existing plant remains a viable option as opposed to constructing a new package plant to treat the recovered ground water and basin fluids.

The companies also proposed in the FS Report that the package plant should be considered as a contingency, should the proposed modifications to the existing plant be found infeasible or if, based on bench-scale and/or pilot studies, it is later determined that the existing WWTP cannot adequately treat the liquids. EPA agreed with the approach presented in the FS Report and modified the PRAP accordingly.

3. **The NPDES contingency cannot be open-ended.**

EPA Response: As presented in the FS Report submitted by Avtex Fibers, Inc. and FMC Corporation, upgrades to the existing WWTP are considered part of the remedial action. EPA takes no position as to the apportionment of liability of costs for remediation associated with the existing WWTP. Under CERCLA, each of the PRPs may be jointly and severably liable for implementing the selected remedy and for the cost thereof. Absent a showing a divisible injury, EPA takes no position the allocation of liability among PRPs.

AR304258

4. **Joinder of PRPs.**

EPA Response: EPA is evaluating the information provided by FMC Corporation concerning additional responsible parties and, where appropriate, will issue notice letters to these parties. EPA welcomes all information concerning other parties that may be PRPs at the Avtex Fibers site.

D. Other Issues Not Appropriate to Superfund

Other issues raised in writing during the public comment period, but which could not be addressed under Superfund, included the following:

- Dikes built and installed by Avtex along the Shenandoah River across from the Fiddler's Green subdivision;
- Fiddler's Green and Rivermont Acres subdivision settlements, transactions, and negotiations with Avtex Fibers, Inc.;
- Operations internal to the Avtex Fibers facility, including pensions and benefits;
- The installation of a sewer line through the Fiddler's Green subdivision; and
- The the removal of top soil from Fiddler's Green lots.

Superfund is designed to address past hazardous waste disposal and handling practices that have resulted in proven or potential environmental problems. It does not provide the authority to respond to current waste production nor to activities that are internal to currently operating facilities. Hazardous waste that is being produced today is regulated under the Resource Conservation and Recovery Act (RCRA).

ATTACHMENT 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

Avtex Fibers, Inc.
Superfund Site
Public Meeting

Wednesday, September 14, 1988

Agenda

Opening Remarks Superfund Discussion	Colleen Leyden, EPA Superfund Community Relations Coordinator
Technical Presentation	Ruth Rzepski, EPA Enforcement Project Manager
Questions and Answers	
Closing Remarks	Colleen Leyden

Attending Experts

E.Ann Cardinal, EPA
Superfund Community Relations Coordinator

Bruce Mulholt, EPA
Toxicologist

James Adams, Remedial Design/Remedial Action Supervisor
Virginia Department of Waste Management

AR304260

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

AVTEX FIBERS SUPERFUND SITE

FRONT ROYAL, VIRGINIA

The Avtex Fibers, Inc. site is an active synthetic manufacturing facility located on Kendrick Lane in Front Royal, Virginia. The facility occupies approximately 440 acres, includes 23 unlined basins, and is situated along the South Fork of the Shenandoah River.

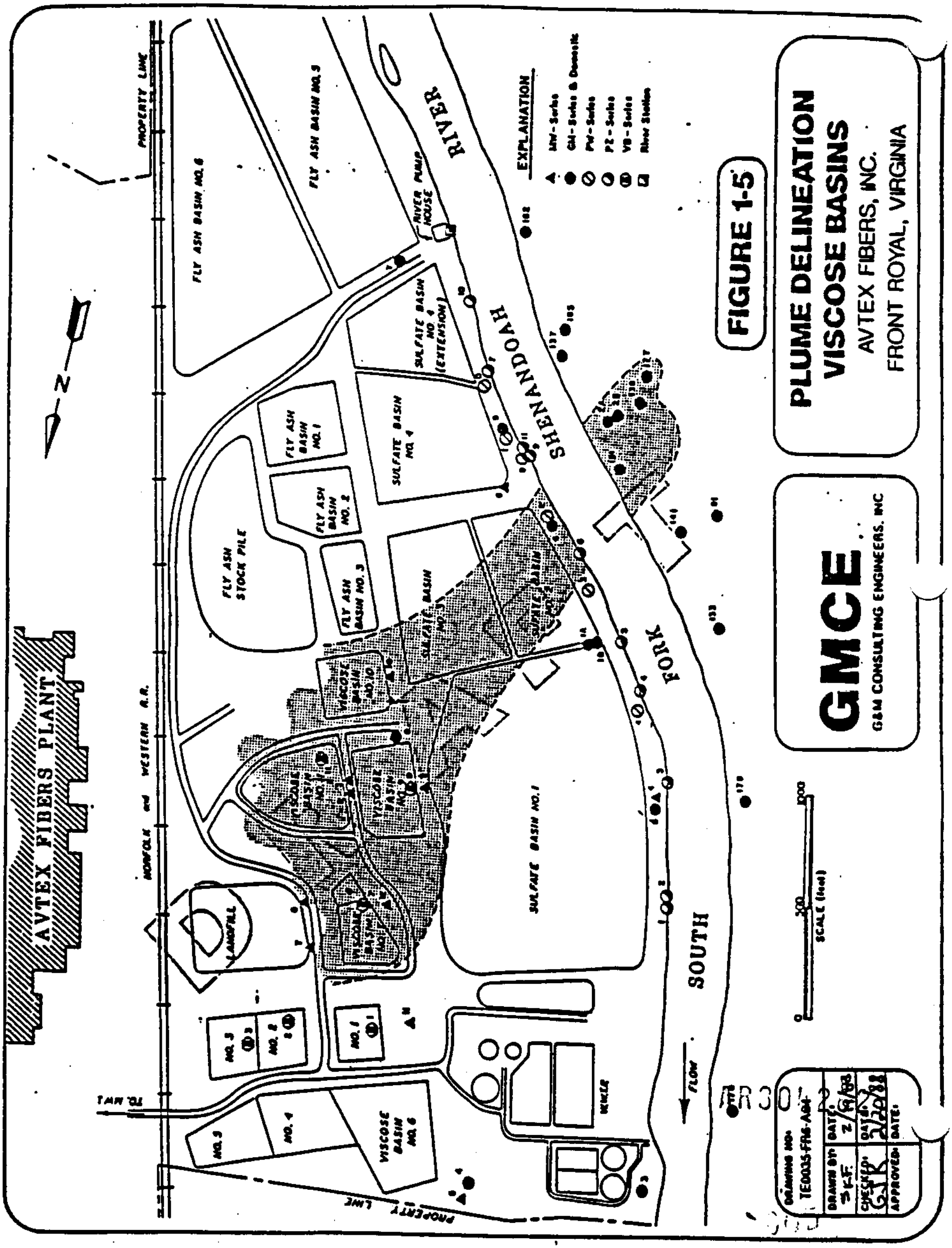
Avtex Fibers has been in operation since 1940, when American Viscose opened the first rayon production plant there. Subsequently, the site was sold to FMC Corporation in 1963, and to its present owner, Avtex Fibers, Inc., in 1976. Rayon fibers have been in constant production at the site since its opening, polyester was produced between 1970 and 1977, and polypropylene has been produced since 1985.

Wastes disposed at the site are byproducts of the rayon production process and include sodium cellulose viscose, zinc-hydroxide sludge and carbon disulfide, a constituent of viscose waste.

The Avtex Fibers site was proposed to the National Priorities List (NPL) in October, 1984 and was added to the list in 1986. The NPL is the list of hazardous waste sites eligible to receive Federal, long-term, cleanup funds under the Comprehensive Environmental Response, Compensation and Liability Act, enacted by Congress in 1980 and commonly known as Superfund.

Superfund is designed to address past hazardous waste disposal and handling practices that have resulted in proven or potential problems. It does not provide the authority to respond to current waste production nor to activities that are internal to currently operating facilities.

G&M Consulting Engineers, Inc.



THE FOLLOWING TABLE CONTAINS THE PROPOSED CLEANUP GOALS FOR AQUIFER RESTORATION. THESE LEVELS ARE BASED ON VALUES DERIVED FROM THE FOLLOWING: MCLs FROM THE FEDERAL DRINKING WATER STANDARDS, EPA REFERENCE DOSE-BASED WATER LIMITS FEDERAL WATER QUALITY CRITERIA AND VIRGINIA DRINKING WATER STANDARDS.

THESE CLEANUP GOALS ARE BASED ON IDENTIFYING THE AQUIFER OF CONCERN AS EQUIVALENT TO A CLASS II AQUIFER. A CLASS II AQUIFER MEANS THE AQUIFER IS CURRENTLY USED OR HAS THE POTENTIAL TO BE USED AS A DRINKING WATER SOURCE.

PARAMETER	CLEANUP GOAL (mg/l)
CARBON DISULFIDE	0.7
HYDROGEN SULFIDE	TBD*
PHENOLICS	0.3
LEAD	0.05
ARSENIC	0.05
CADMIUM	TBD*

*TBD - CLEANUP GOAL WILL BE ESTABLISHED AFTER FURTHER CHARACTERIZATION OF BACKGROUND QUALITY CONDITIONS.

ATTACHMENT 2

Superfund Update

Avtex Fibers Site

Front Royal, Virginia

EPA

Region 3 *August 1988*

PROPOSED REMEDIAL ACTION PLAN

Purpose of the Proposed Plan

This proposed remedial action plan (Proposed Plan, or PRAP) describes the preferred alternative for addressing ground-water contamination at the Avtex Fibers, Inc. Superfund site in Front Royal, Warren County, Virginia. This action is considered to be Operable Unit 1 in a two-step process to clean up the Avtex site. The United States Environmental Protection Agency (EPA) has recently completed review of a Remedial Investigation (RI) and Feasibility Study (FS) conducted by Geraghty & Miller, Inc. under an Administrative Order between Avtex Fibers, Inc., FMC Corporation, and EPA. The RI report characterizes the nature and extent of contamination present at the site; the FS report describes how various cleanup technologies that may address site contamination were developed, evaluated, and screened. The preferred alternative is based primarily on the RI and FS documents.

This Proposed Plan is being distributed in order to solicit public comment regarding the most acceptable method for addressing the ground-water contamination present at the Avtex Fibers site, Operable Unit 1. The fact sheet begins with a brief history of the Avtex Fibers site, describes the purpose of the Superfund program, and outlines the findings of the RI. It also summarizes project objectives, the alternatives considered for Operable Unit 1 at the site, the preferred alternative and the rationale for its designation. Finally, the fact sheet explains community relations during the remedy selection process and lists sources for further information.

Site Description and Background

The Avtex Fibers, Inc. site is an active synthetic fibers manufacturing facility that is located at 1169 Kendrick Lane, in Front Royal, Virginia. Situated along the east bank of the South Fork of the Shenandoah River, the facility occupies approximately 440 acres, 60 of which are under roof, and includes 23 unlined waste disposal structures. In addition to the river, the site is surrounded to the south, east, and northwest by residential areas. Approximately 1,300 people live within one mile of the site.

The Avtex Fibers site has been in operation since 1940, when American Viscose opened the first rayon production plant there. Subsequently, the site was sold to FMC Corporation in 1963, and to its present owner, Avtex Fibers, Inc., in 1976. Rayon fibers have been in constant production at the site since its opening; polyester was made there between 1970 and 1977, and polypropylene has been produced since 1985.

Wastes disposed at the site are byproducts of the rayon production process, which generates two major products: sodium cellulose viscose, and zinc-hydroxide (sulfate) sludge. Between 1940 and 1983, approximately 14 million cubic feet of waste viscose was disposed in 11 unlined surface impoundments (basins) on site. After 1983 disposal in the basins ceased and the liquid viscose was treated in the wastewater treatment plant (WWTP) located on the site. Sludge was disposed in seven unlined basins, which cover approximately 85 acres. In addition to the 18 viscose and sludge basins, fly-ash (material removed from incinerator exhaust by air-pollution control devices) and boiler-house solids have been disposed in five other surface impoundments.

In 1982, carbon disulfide, a constituent of viscose waste, was identified in private wells located in a subdivision across the Shenandoah River from Avtex. The Virginia State Water Control Board requested that Avtex perform a ground-water study. After the investigations were completed, the company undertook measures to address the contamination, including purchase of subdivision properties and ground-water pumping and treatment.

EPA proposed the Avtex Fibers site on the EPA Superfund National Priorities List (NPL), the list of hazardous waste sites eligible to receive Federal long-term cleanup funds, in October 1984. Avtex Fibers, Inc. and EPA in 1986 entered into an Administrative Order to conduct an RI/FS at the site; this Order was amended in 1988 to include FMC Corporation as a respondent. The purpose of the RI/FS was to define the nature and extent of contamination at the site, determine any potential threat posed, and evaluate possible cleanup alternatives for the site. Work was begun in 1986. The Virginia Department of Waste Management is the support agency in this action.

Purpose of the Superfund Program

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted in 1980. The law provided broad Federal authority and money to respond to releases or threats of releases that could endanger human health or the environment. Superfund is designed to address past hazardous waste disposal and handling practices that have resulted in proven or potential problems. It does not provide the authority to respond to current waste production nor to activities that are internal to currently operating facilities. Hazardous waste that is being produced today is regulated under a separate statute, the Resource Conservation and Recovery Act (RCRA).

The U.S. EPA has the primary responsibility for managing activities under Superfund, although numerous other parties are involved with a response. Each cleanup action must be designed to respond to the unique conditions of a specific hazardous waste site; each response is a coordinated effort of federal, state, and local governments, private industry, and citizens.

EPA makes every effort to encourage those responsible for creating the problem to conduct or pay for the cleanup by negotiating with the potentially responsible parties (PRP's) and using the enforcement authorities in the Superfund law. The Superfund program is based on the principle that "the polluter pays." EPA also involves state governments in all phases of response. The Agency provides a number of opportunities to states to review and comment on documents, become involved in long-term planning, and participate in negotiations with PRP's. States also may assume the lead role in managing cleanup activities.

Findings of the Remedial Investigation

The RI conducted at the Avtex Fibers site examined the various site environmental media at the site, including the ground water and the viscose basins. Major findings and conclusions of the RI were as follows:

- Ground-water analyses indicate that a narrow band, or plume, of ground-water contamination composed of carbon disulfides, sulfides, phenols, and cadmium is present on the site. This plume appears to be caused by leaching of viscose waste from Viscose Basins 9, 10, and 11. Because the constituents detected are the same as or similar to those found in wells on the western bank of the Shenandoah River, the plume is interpreted to extend from Basins 9, 10, and 11 across the river.

- A narrower band of arsenic exists within the area of ground-water contaminated by disulfides and phenols. This appears to have been caused by the interaction of the leachate from the viscose basins and their surrounding berms, or protective embankments, that are composed of clay with a fly-ash core.

- Viscose Basins 9, 10, and 11 contain significantly higher concentrations of carbon disulfide than Basins 1, 2, 3, and 7. Whereas liquid and solids from Basins 1, 2, 3, and 7 show disulfide levels of less than 1.5 parts per million (ppm) and 3 ppm, respectively, liquid and solid samples from Basins 9, 10, and 11 contain concentrations of up to 3,500 ppm and 20,000 ppm, respectively.

- Constituents detected at the Avtex site include arsenic, cadmium, carbon, lead, disulfide, chlorine, iron, sulfate, sulfide, and zinc. Release of these substances is due primarily to precipitation infiltration and leaching of the viscose.

- Potential exposure pathways to chemicals present on site are dermal (skin) contact with viscose waste, ground water, or surface water; ingestion of ground water; and inhalation. Most of the exposure pathways are of limited access. As a result, chemical-based health risks are within acceptable ranges.

- Carbon disulfide, arsenic, sulfide, cadmium, phenols, and lead are the substances of primary concern in the ground water.

Remedial Objectives

The remedial-action objectives for the Avtex Fibers site address ground-water management and interim source control for the protection of human health, public welfare, and the environment. The remedial action selected for the Avtex facility will satisfy the following primary objectives:

- Eliminate the potential for dermal contact or ingestion of waste material

- Reduce or eliminate the infiltration of the basin liquids to the ground water

- Manage the migration of contaminated ground water from the site

- Remediate, or clean up, contaminated ground water to acceptable health levels.

Each of the alternatives considered for the first operable unit implemented at the site was evaluated against these objectives.

Summary of Remedial Alternatives

Three remedial alternatives were identified as possible response actions to address the contaminated ground water at the Avtex Fibers site, Operable Unit 1. This operable unit is the first of two planned to address the full extent of contamination at the site. It will focus on eliminating ground-water contamination and on implementing interim remedial measures to prevent further wastes from being released from Viscose Basins 9, 10, and 11. Interim remedial measures include basin dewatering.

Once EPA has fully evaluated the ef dewatering the waste viscose basin the toxicity of the waste, a second o unit will be selected to undertake fir... remedial actions for the viscose basins. It will first be necessary to implement the

AR304266

interim measure of basin dewatering before any of the permanent remedies evaluated in the Draft FS report can be selected. This is because the total reduction in toxicity that will be brought about by dewatering and natural disulfide degradation can only be estimated at this time. EPA, therefore, is recommending that the decision of the final preferred alternative be deferred until the toxicity of the dewatered waste can be evaluated and verified.

Each of the three alternatives for Operable Unit 1 is briefly summarized below.

Alternative 1 - No Action with Site Security

This alternative meets the requirements of the National Contingency Plan. The purpose of including a no-action alternative is to provide a basis for comparing existing site conditions with those resulting from the implementation of the other proposed alternatives. Under the no-action alternative, no measures will be taken to address ground-water contamination migration pathways. The two major components of this alternative are installation of a security fence, including its annual maintenance, and quarterly ground-water monitoring.

The Present Worth Cost of Alternative 1 is $603,000.

Alternative 2 - Ground-Water Recovery, Basin Dewatering with Treatment in Existing Wastewater Treatment Plant (WWTP), Following Pretreatment of the Recovered Fluids

This alternative involves the extraction of contaminated ground water from wells PW-1, -2, and -3 and the dewatering and collection of liquids from Viscose Basins 9, 10, and 11. The recovered liquids would be treated in the existing WWTP, following pretreatment to reduce their organic chemical content. Ground-water monitoring will ensure that the ground-water recovery system is operating as designed.

Following the construction of the pretreatment units, the removal of the liquids from the viscose basins should be completed in approximately two years, based on the present estimated liquid-recovery rate of 50 gallons per minute (gpm). Basin dewatering will continue until the final remedial action for the viscose waste basins is decided. Ground-water recovery will continue until ground-water cleanup levels are reached.

The Present Worth Cost of Alternative 2 is $7,080,000.

Alternative 3 - Ground-Water Recovery, Basin Dewatering with Treatment in Package (New) WWTP

This alternative also requires the same remedial measures for the ground water and the same interim remedial measures of viscose basin dewatering as Alternative 2. The key difference between Alternatives 2 and 3 is the wastewater treatment system that will be used for the treatment of the recovered fluids. Alternative 3 requires the construction of a new WWTP. This new plant will use a conventional activated-sludge process.

The removal of the viscose basin liquids should be completed in two years following completion of construction of the WWTP.

The Present Worth Cost of Alternative 3 is $10,212,000.

Preferred Alternative and Rationale for Selection

After careful consideration of the alternatives, EPA recommends that Alternative 3, Ground-Water Recovery, Basin Dewatering with Treatment in a New WWTP, be implemented. The rationale for selection of Alternative 3 is as follows :

AR304267

Although Alternative 2 could be implemented more quickly, the existing WWTP has not been in compliance with the water interim measure of basin dewatering before any of the permanent remedies evaluated in the Draft FS report can be selected. This is because the total reduction in toxicity that will be brought about by dewatering and natural disulfide degradation can only be estimated at this time. EPA, therefore, is recommending that the decision of the final preferred alternative be deferred until the toxicity of the dewatered waste can be evaluated and verified.

Each of the three alternatives for Operable Unit 1 is briefly summarized below.

Alternative 1 - No Action with Site Security

This alternative meets the requirements of the National Contingency Plan. The purpose of including a no-action alternative is to provide a basis for comparing existing site conditions with those resulting from the implementation of the other proposed alternatives. Under the no-action alternative, no measures will be taken to address ground-water contamination migration pathways. The two major components of this alternative are installation of a security fence, including its annual maintenance, and quarterly ground-water monitoring.

The Present Worth Cost of Alternative 1 is $603,000.

Alternative 2 - Restrict Access, Ground-Water Recovery, Basin Dewatering with Treatment in Existing Wastewater Treatment Plant (WWTP), Following Pretreatment of the Recovered Fluids

This alternative involves placing a security fence around Viscose Basins 9, 10, and 11. In addition, it includes the extraction of contaminated ground water from wells PW-1, -2, and -3 and the dewatering and collection of liquids from Viscose Basins 9, 10, and 11. The recovered liquids would be treated in the existing WWTP, following pretreatment to reduce their organic chemical content. Ground-water monitoring will ensure that the ground-water recovery system is operating as designed.

Following the construction of the pretreatment units, the removal of the liquids from the viscose basins should be completed in approximately two years, based on the present estimated liquid-recovery rate of 50 gallons per minute (gpm). Basin dewatering will continue until the final remedial action for the viscose waste basins is decided. Ground-water recovery will continue until ground-water cleanup levels are reached.

The Present Worth Cost of Alternative 2 is $7,080,000.

Alternative 3 - Restrict Access, Ground-Water Recovery, Basin Dewatering with Treatment in Package (New) WWTP

This alternative also includes constructing a fence and requires the same remedial measures for the ground water and the same interim remedial measures of viscose basin dewatering as Alternative 2. The key difference between Alternatives 2 and 3 is the wastewater treatment system that will be used for the treatment of the recovered fluids. Alternative 3 requires the construction of a new WWTP. This new plant will use a conventional activated-sludge process.

The removal of the viscose basin liquids should be completed in two years following completion of construction of the WWTP.

The Present Worth Cost of Alternative 3 is $10,212,000.

Preferred Alternative and Rationale for Selection

After careful consideration of the alternatives, EPA recommends that Alternative 3, Restrict Access, Ground-Water Recovery, Basin Dewatering with Treatment in a New WWTP, be implemented. The rationale for selection of Alternative 3 is as follows :

AR301268

Although Alternative 2 could be implemented more quickly, the existing WWTP has not been in compliance with the water discharge permit that was issued by the Virginia State Water Control Board. Because the facility has not functioned properly in the last year and is currently in violation of its permit, EPA does not recommend that the recovered waste fluids and ground water be treated in the existing WWTP.

The criteria used to evaluate the alternatives for this operable unit include effectiveness, implementability, and cost-effectiveness. Together, the above remedial measures included in Alternative 3 will meet all of EPA's remedial objectives for Operable Unit 1. As combined actions they will minimize direct contact with the viscose basins, reduce the volume of infiltration of the basin liquids to ground water, manage the migration of the plume of contamination, and begin to remediate the ground water to acceptable, health-based levels of contaminants.

Community Role in the Selection Process

EPA relies on public comment to ensure that the remedial alternatives being evaluated and selected for each Superfund site are fully understood and that the concerns of the local community have been considered. Written comments on the RI/FS and the PRAP can be submitted through September 26, 1988, to:

Ruth Rzepski
Enforcement Project Manager
U.S. Environmental Protection Agency (3HW16)
841 Chestnut Street
Philadelphia, Pennsylvania 19107.

All public comments will be recorded and responded to in the Responsiveness Summary section of the Record of Decision (ROD) for the Avtex Fibers site. A ROD is a legal document prepared by EPA that describes the selected remedial action(s) for a Superfund site. The selection of remedy will be made after full consideration of all public comments on the RI/FS and the PRAP, and will be documented in the ROD.

For More Information

If you have any questions or need additional information concerning the Avtex Fibers site, you can call this toll-free number, 1-800-438-2474, or you can contact:

Colleen Leyden
Community Relations Coordinator
U.S. EPA, Region III (3PA00)
841 Chestnut Street
Philadelphia, Pennsylvania 19107
(215) 597-8573

Ruth Rzepski
Enforcement Project Manager
U.S. EPA, Region III (3HW16)
841 Chestnut Street
Philadelphia, Pennsylvania 19107
(215) 597-1113.

Copies of the RI/FS and other information used in the remedy selection process are part of the Administrative Record for the site, which is established at the following location:

Samuels Public Library
538 Villa Avenue
Front Royal, Virginia 22630
(703) 635-3153
Contact: Maria Chiodi.

MAILING LIST ADDITIONS

To be placed on the mailing list to receive information of the Avtex Fibers, Inc. Site, please complete this form and mail to:

Colleen Leyden
Community Relations Coordinator, U.S. EPA, Region III (3PA00)
841 Chestnut Street, Philadelphia, Pennsylvania 19107.

Name ______________________________

Address ______________________________

Affiliation ______________________________

Telephone ______________________________

United States
Environmental Protection Agency

Region III
841 Chestnut Street
Philadelphia, PA 19107

Official Business
Penalty for Private Use
$300

ADDENDUM TO THE AVTEX FIBERS PROPOSED REMEDIAL ACTION PLAN

Summary of Remedial Alternatives

Three remedial alternatives were identified as possible response actions to address the contaminated ground water at the Avtex Fibers site, Operable Unit 1. This operable unit is the first of two planned to address the full extent of contamination at the site. It will focus on eliminating ground-water contamination and on implementing interim remedial measures to prevent further wastes from being released from Viscose Basins 9, 10, and 11. Interim remedial measures include basin dewatering.

Once EPA has fully evaluated the effect that dewatering the waste viscose basins has on the toxicity of the waste, a second operable unit will be selected to undertake final remedial actions for the viscose basins. It will first be necessary to implement the interim measure of basin dewatering before any of the permanent remedies evaluated in the Draft FS report can be selected. This is because the total reduction in toxicity that will be brought about by dewatering and natural disulfide degradation can only be estimated at this time. EPA, therefore, is recommending that the decision of the final preferred alternative be deferred until the toxicity of the dewatered waste can be evaluated and verified.

Each of the three alternatives for Operable Unit 1 is briefly summarized below.

<u>Alternative 1 - No Action with Site Security</u>

This alternative meets the requirements of the National Contingency Plan. The purpose of including a no-action alternative is to provide a basis for comparing existing site conditions with those resulting from the implementation of the other proposed alternatives. Under the no-action alternative, no measures will be taken to address ground-water contamination migration pathways. The two major components of this alternative are installation of a security fence, including its annual maintenance, and quarterly ground-water monitoring.

The estimated Present Worth Cost of Alternative 1 is $603,000.

<u>Alternative 2 - Ground-Water Recovery, Basin Dewatering with Treatment in Upgraded, Existing Wastewater Treatment Plant (WWTP), Following Pretreatment of the Recovered Fluids</u>

This alternative involves the extraction of contaminated ground water from wells PW-1, -2, and -3 and the dewatering and collection of liquids from Viscose Basins 9, 10, and 11. The recovered liquids would be treated in the upgraded,existing WWTP, following pretreatment to reduce their organic chemical content. Ground-water monitoring will ensure that the ground-water recovery system is operating as designed.

Following the construction of the upgrades and pretreatment units, the removal of the liquids from the viscose basins should be completed in approximately two years, based on the present estimated liquid-recovery rate of 50 gallons per minute (gpm). Basin dewatering will continue until the final remedial action for the viscose waste basins is decided. Ground-water recovery will continue until ground-water cleanup levels are reached.

The estimated Present Worth Cost of Alternative 2 is $9,122,000.

Alternative 3 - Ground-Water Recovery, Basin Dewatering with Treatment in Package (New) WWTP

This alternative also requires the same remedial measures for the ground water and the same interim remedial measures of viscose basin dewatering as Alternative 2. The key difference between Alternatives 2 and 3 is the wastewater treatment system that will be used for the treatment of the recovered fluids. Alternative 3 requires the construction of a new WWTP. This new plant will use a conventional activated-sludge process.

The removal of the viscose basin liquids should be completed in two years following completion of construction of the WWTP.

The estimated Present Worth Cost of Alternative 3 is $15,421,000.

Preferred Alternative and Rationale for Selection

New information has become available since the release of the PRAP for the Avtex Fibers site on August 27, 1988. Avtex Fibers, Inc. and FMC Corporation have proposed modifying or upgrading the existing WWTP so that it can attain and maintain compliance with the National Pollution Discharge Elimination System (NPDES) Permit requirements.

Previously, EPA had recommended Alternative 3, which would have required the construction of a package (new) WWTP to treat ground water and basin fluids. After careful reconsideration of Alternative 2 as now proposed, Alternative 2 is now the preferred alternative. The implementation of Alternative 2, however, will be contingent on the ability of the existing plant to attain NPDES compliance and properly treat the recovered liquids.

If Alternative 2 cannot be implemented successfully, Alternative 3 will then be initiated.

The criteria used to evaluate the alternatives for the operable unit include effectiveness, implementability, and cost-effectivenes. Together, the above remedial measures included in Alternative 2 will meet all of EPA's remedial objectives for Operable Unit 1. As combined actions they will minimize direct contact with the viscose basins, reduce the volume of infiltration of the basin liquids to ground water, manage the migration of the plume of contamination, and begin to remediate the ground water to acceptable, health-based levels of contaminants.